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| <i>A61P 11/06</i> (2006.01) | |

(54) **Pyrimidinylacetic acid derivatives useful for the treatment of diseases mediated by CRTH2**

Pyrimidin-Essigsäure Derivate geeignet zur Behandlung von CRTH2-bedingten Krankheiten

Derivés de l'acid pyrimidinylacétique pour le traitement des maladies associées au CRTH2

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(56) References cited:
EP-A- 1 170 594 **DE-A- 4 239 440**

- **SUGIMOTO, HIROMI ET AL: "An orally bioavailable small molecule antagonist of CRTH2, ramatroban (BAY u3405), inhibits prostaglandin D2-induced eosinophil migration in vitro" JOURNAL OF PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS (2003), 305(1), 347-352 , XP009015091**

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Description

DETAILED DESCRIPTION OF INVENTION

TECHNICAL FIELD

[0001] The present invention relates to a pyrimidinylacetic acid derivative which is useful as an active ingredient of pharmaceutical preparations. The pyrimidinylacetic acid derivative of the present invention has CRTH2 (G-protein-coupled chemoattractant receptor, expressed on Th2 cells) antagonistic activity and can be used for the prophylaxis and treatment of diseases associated with CRTH2 activity, in particular for the treatment of allergic diseases, such as asthma, allergic rhinitis and allergic conjunctivitis; eosinophil-related diseases, such as Churg-Strauss syndrome and sinusitis; and basophil-related diseases, such as basophilic leukemia, chronic urticaria and basophilic leukocytosis in human and other mammals.

BACKGROUND ART

[0002] CRTH2 is a G-protein-coupled chemoattractant receptor, expressed on Th2 cells (Nagata et al. J. Immunol., **162**, 1278-1286, 1999), eosinophils and basophils (Hirai et al., J. Exp. Med., **193**, 255-261, 2001).

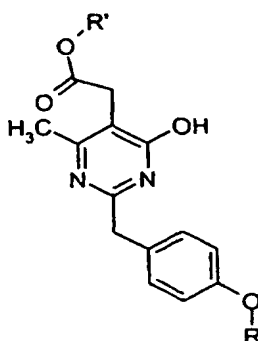
[0003] Th2-polarization has been seen in allergic diseases, such as asthma, allergic rhinitis, atopic dermatitis and allergic conjunctivitis (Romagnani S. Immunology Today, **18**, 263-266, 1997; Hammad H. et al., Blood, **98**, 1135-1141, 2001). Th2 cells regulate allergic diseases by producing Th2 cytokines, such as IL-4, IL-5 and IL-13 (Oriss et al., J. Immunol., **162**, 1999-2007, 1999; Viola et al., Blood, **91**, 2223-2230, 1998; Webb et al., J. Immunol., **165**, 108-113, 2000; Dumont F.J., Exp. Opin. Ther. Pat., **12**, 341-367, 2002). These Th2 cytokines directly or indirectly induce migration, activation, priming and prolonged survival of effector cells, such as eosinophils and basophils, in allergic diseases (Sanz et al., J. Immunol., **160**, 5637-5645, 1998; Pope et al., J. Allergy Clin. Immunol., **108**, 594-601, 2001; Teran L.M., Clin. Exp. Allergy, **29**, 287-290, 1999).

[0004] PGD₂, a ligand for CRTH2, is produced from mast cells and another important effector cells in allergic diseases (Nagata et al., FEBS Lett. **459**, 195-199, 1999; Hirai et al., J. Exp. Med., **193**, 255-261, 2001). PGD₂ induces migration and activation of Th2 cells, eosinophils, and basophils, via CRTH2 (Hirai et al., J. Exp. Med., **193**, 255-261, 2001; Gervais et al., J. Allergy Clin. Immunol., **108**, 982-988, 2001; Sugimoto et al., J. Pharmacol. Exp. Ther., **305**, (1), 347-52, 2003).

[0005] Therefore, antagonists which inhibit the binding of CRTH2 and PGD₂ should be useful for the treatment of allergic diseases, such as asthma, allergic rhinitis, atopic dermatitis and allergic conjunctivitis.

[0006] In addition, several experimental evidence has demonstrated the contribution of eosinophils in sinusitis (Hamilos et al., Am. J. Respir. Cell and Mol. Biol., **15**, 443-450, 1996; Fan et al., J. Allergy Clin. Immunol., **106**, 551-558, 2000), and Churg-Strauss syndrome (Coffin et al., J. Allergy Clin. Immunol., **101**, 116-123, 1998; Kurosawa et al., Allergy, **55**, 785-787, 2000). In the tissues of these patients, mast cells can be observed to be colocalized with eosinophils (Khan et al., J. Allergy Clin. Immunol., **106**, 1096-1101, 2000). It is suggested that PGD₂ production from mast cells induces the recruitment of eosinophils. Therefore, CRTH2 antagonists are also useful for the treatment of other eosinophil-related diseases such as Churg-Strauss syndrome and sinusitis. CRTH2 antagonists can also be useful for the treatment of some basophil-related diseases such as basophilic leukemia, chronic urticaria and basophilic leukocytosis, because of high expression of CRTH2 on basophils.

[0007] Ordukhanyan, A. A et al. discloses the synthesis of pyrimidine derivative represented by the general formula:

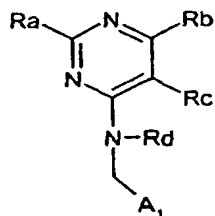


wherein

R = alkyl
R' = H or alkyl

as an intermediate for the preparation of antineoplastic agent (Khimiko-Farmatsevticheskii Zhurnal (1979), 13(9), 36-40).

[0008] GB2262096 discloses pyrimidine derivative represented by the general formula:



wherein

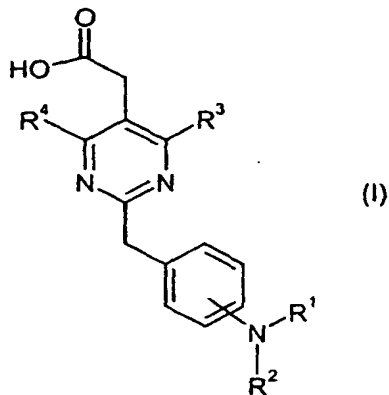
A₁, Ra, Rb, Rc, and Rd are defined in the application, as an angiotensin II antagonist.

[0009] However, none of the references and other reference discloses pyrimidinylacetic acid derivatives having CRTH2 antagonistic activity.

[0010] The development of a compound, which has effective CRTH2 antagonistic activity and can be used for the prophylaxis and treatment of diseases associated with CRTH2 activity, has been desired.

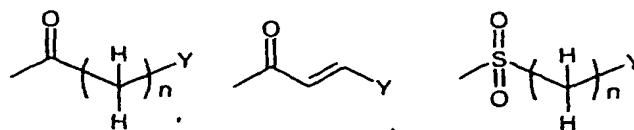
SUMMARY OF THE INVENTION

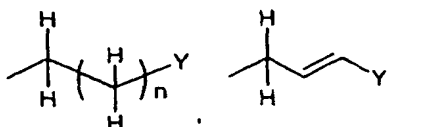
[0011] This invention is to provide a pyrimidinylacetic acid derivative of the formula (I), their tautomeric and stereoisomeric form, and salts thereof:



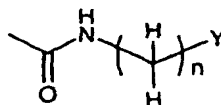
wherein

R¹ represents





or



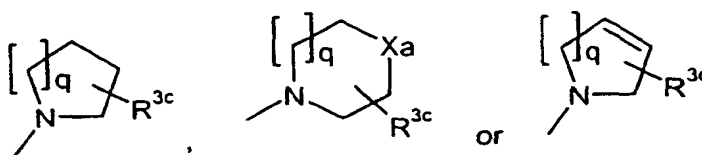
in which

n represents an integer of 0 to 6;

Y represents hydrogen, C_{3-8} cycloalkyl optionally substituted by C_{1-6} alkyl or C_{3-8} cycloalkyl fused by benzene, aryl or heteroaryl, wherein said aryl and heteroaryl are optionally substituted at a substitutable position with one or more substituents selected from the group consisting of cyano, halogen, nitro, guanidino, pyrrolyl, sulfamoyl, C_{1-6} alkylaminosulfonyl, di(C_{1-6} alkyl)aminosulfonyl, phenyloxy, phenyl, amino, C_{1-6} alkylamino, di(C_{1-6})alkylamino, C_{1-6} alkoxycarbonyl, C_{1-6} alkanoyl, C_{1-6} alkanoylamino, carbamoyl, C_{1-6} alkylcarbamoyl, di-(C_{1-6} alkyl)carbamoyl, C_{1-6} alkylsulfonyl, C_{1-6} alkyl optionally substituted by mono-, di-, or tri-halogen, C_{1-6} alkoxy optionally substituted by mono-, di-, or tri- halogen and C_{1-6} alkylthio optionally substituted by mono-, di-, or tri- halogen, or aryl fused by 1,3-dioxolane;

R^2 represents hydrogen or C_{1-6} alkyl;

R^3 represents C_{1-6} alkoxy optionally substituted by mono-, di-, or tri- halogen,



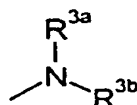
q represents an integer of 1 to 3;

R^{3c} represents hydrogen, hydroxy, carboxy, or C_{1-6} alkyl optionally substituted by hydroxy, carboxy or (phenylsubstituted C_{1-6} alkyl)carbamoyl;

Xa represents -O-, -S- or -N(R^{3d})-

in which

R^{3d} represents C_{1-6} alkyl; or



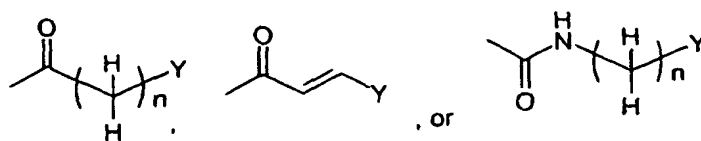
in which

R^{3a} , and R^{3b} independently represent C_{3-8} cycloalkyl, or C_{1-6} alkyl optionally substituted by carboxy, C_{3-8} cycloalkyl, carbamoyl, C_{1-6} alkylcarbamoyl, aryl-substituted C_{1-6} alkylcarbamoyl, di(C_{1-6} alkyl)carbamoyl, C_{3-8} cycloalkylcarbamoyl, C_{3-8} heterocyclocarbonyl, (C_{1-6})alkylamino, di(C_{1-6})alkylamino or C_{1-6} alkoxy; or

R⁴ represents hydrogen, halogen, C₁₋₆ alkoxy, di(C₁₋₆ alkyl)amino, C₁₋₆ alkyl optionally substituted by mono-, di-, or tri- halogen.

[0012] In one embodiment, compounds of the formula (I) are those wherein:

R¹ represents



in which

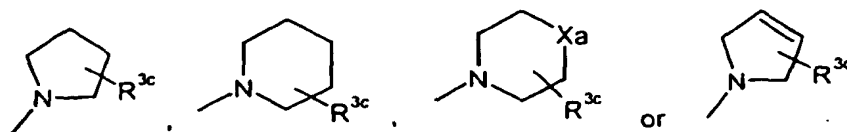
n represents an integer of 0 to 2;

Y represents C₃₋₈ cycloalkyl optionally substituted by C₁₋₆ alkyl, C₃₋₈ cycloalkyl fused by benzene, aryl selected from the group consisting of phenyl and naphthyl, or heteroaryl selected from the group consisting of indolyl, quinolyl, benzofuranyl, furanyl and pyridyl, wherein said aryl and heteroaryl are optionally substituted at a substitutable position with one or more substituents selected from the group consisting of cyano, halogen, nitro, pyrrolyl, sulfamoyl, C₁₋₆ alkylaminosulfonyl, di(C₁₋₆ alkyl)aminosulfonyl, phenyloxy, phenyl, C₁₋₆ alkylamino, di(C₁₋₆ alkyl)amino, C₁₋₆ alkoxycarbonyl, C₁₋₆ alkanoylamino, carbamoyl, C₁₋₆ alkylcarbamoyl, di-(C₁₋₆ alkyl)carbamoyl, C₁₋₆ alkylsulfonyl, C₁₋₆ alkyl optionally substituted by mono-, di-, or tri-halogen, C₁₋₆ alkoxy optionally substituted by mono-, di-, or tri- halogen and C₁₋₆ alkylthio optionally substituted by mono-, di-, or tri- halogen; or

R² represents hydrogen.

[0013] In another embodiment, compounds of the formula (I) are those wherein:

R³ represents C₁₋₆ alkoxy optionally substituted by mono-, di-, or tri- halogen,

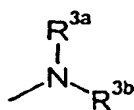


R^{3c} represents hydrogen, hydroxy, carboxy, or C₁₋₆ alkyl optionally substituted by hydroxy, carboxy or (phenylsubstituted C₁₋₆ alkyl)carbamoyl,

Xa represents -O-, -S- or -N(R^{3d})-

in which

R^{3d} represents C₁₋₆ alkyl, or



in which

R^{3a} and R^{3b} independently represent C₁₋₆ alkyl optionally substituted by carboxy, C₃₋₈ cycloalkyl, carbamoyl, C₁₋₆ alkylcarbamoyl, di(C₁₋₆ alkyl)carbamoyl, C₃₋₈ cycloalkylcarbamoyl, C₃₋₈ heterocyclocarbonyl, (C₁₋₆)alkylamino, di(C₁₋₆)alkylamino or C₁₋₆ alkoxy.

[0014] The preferable compounds of the present invention are as follows:

{4-methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrazolidinyl)-5-pyrimidinyl}acetic acid;

{2-[4-[(3,4-dichlorobenzoyl)amino]benzyl]-4-methyl-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;

{4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]pyrimidin-5-yl}acetic acid;

{4-chloro-6-(methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(isopropylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclohexylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3-phenylpropanoyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2-quinolinylcarbonyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-2-[4-[(4-chlorobenzoyl)amino]benzyl]-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3,4-dichlorobenzoyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(4-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(4-methylbenzoyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{2-[4-[(1-benzofuran-2-ylcarbonyl)amino]benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(1H-indol-2-ylcarbonyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-2-[4-[(4-cyanobenzoyl)amino]benzyl]-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2,3-dihydro-1H-inden-2-ylacetyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3-phenoxyphenyl)acetyl]amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-(dimethylamino)-2-[4-[(2-quinolinylcarbonyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

{4-chloro-6-(dimethylamino)-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-5-pyrimidinyl}acetic acid;

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[4-chloro-2- {4-[(3,4-dichlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

[4-chloro-2-{4-[(4-chlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

5 [4-chloro-6-(dimethylamino)-2-{4-[(4-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl]acetic acid;

[4-chloro-6-(dimethylamino)-2-(4-{[(dimethylamino)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;

10 [4-chloro-6-(dimethylamino)-2-(4-{[4-(trifluoromethyl)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;

[4-chloro-2-(4-{[(2E)-3-(4-chlorophenyl)-2-propenoyl]amino}benzyl)-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

[2-{4-[(4-bromobenzoyl)amino]benzyl}-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

15 [4-chloro-2-{4-[(2,5-dichlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

[4-chloro-2-{4-[(3,4-difluorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

20 [4-chloro-2-{4-[(3,5-dichlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

[4-chloro-2-{4-[(3-chlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

(4-chloro-6-(dimethylamino)-2-{4-[(3-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl]acetic acid;

25 [2-(4-{[(4-tert-butylcyclohexyl)carbonyl]amino}benzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

[4-chloro-2- {4-[(4-phenoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

30 [4-chloro-2-{4-[(4-isopropoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

[4-chloro-6-(1-pyrrolidinyl)-2-(4- {4-[(1H-pyrrol-1-yl)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;

[4-chloro-2- {4-[(4-methoxy-3-nitrobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

35 [4-chloro-2-{4-[(4-methoxy-3,5-dimethylbenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

[4-chloro-2-(4- {[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

40 [4-chloro-2- {4-[(3,4-dichlorobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetic acid;

45 {4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4- {methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino}-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

{4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

50 [4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;

[2- {4-[(4-chlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;

55 (4-(dimethylamino)-2-{4-[(4-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl)acetic acid;

[2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;

[4-(dimethylamino)-2-(4-[(2E)-3-phenyl-2-propenoyl]amino)benzyl]-5-pyrimidinyl}acetic acid;
 [2-(4-[(2E)-3-(4-chlorophenyl)-2-propenoyl]amino)benzyl]-4-(dimethylamino)-5-pyrimidinyl}acetic acid;
 5 [4-(dimethylamino)-2-(4-{[4-(trifluoromethyl)benzoyl]amino}benzyl)-5-pyrimidinyl}acetic acid;
 [2-{4-{(4-bromobenzoyl)amino}benzyl}-4-(dimethylamino)-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[cyclohexyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 10 {4-chloro-6-[isopropyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[(2-methoxyethyl)(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 15 {4-chloro-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl}acetic acid;
 [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 20 (4-chloro-6-(dimethylamino)-2-{4-[(1H-indol-6-ylcarbonyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 {4-chloro-6-methoxy-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 25 {4-chloro-6-(2,5-dihydro-1H-pyrrol-1-yl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[ethyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-(3-hydroxy-1-pyrrolidinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 30 [4-chloro-2-(4-{[4-(methylthio)benzoyl]amino}benzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 [4-chloro-2-[4-{(3-chloro-4-methoxybenzoyl)amino}benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 35 {2-[4-(benzoylamino)benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;
 {4-chloro-2-[4-{(cyclohexylacetyl)amino}benzyl]-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;
 40 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[4-(methylphenyl)acetyl]amino}benzyl)-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(1-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 45 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[4-(phenoxyphenyl)acetyl]amino}benzyl)-5-pyrimidinyl}acetic acid;
 [4-chloro-2-[4-{(3,4-dimethoxybenzoyl)amino}benzyl]-6-(dimethylamino)-5-pyrimidinyl}acetic acid;
 {4-chloro-6-(dimethylamino)-2-[3-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 [4-chloro-2-[4-{(4-nitrobenzoyl)amino}benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 55 [2-(4-{[4-(acetyl)amino]benzoyl}amino)benzyl]-4-chloro-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 {2-[4-(benzoylamino)benzyl]-4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;

(4-(dimethylamino)-2-{4-[(2-quinolinylcarbonyl)amino]benzyl}-5-pyrimidinyl)acetic acid;

(4-(dimethylamino)-2-{4-[3-methoxybenzoyl]amino}benzyl}-5-pyrimidinyl)acetic acid;

[2-{4-[(3-chlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;

N-{5-(carboxymethyl)-6-chloro-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl}-N-methylglycine;

{4-chloro-6-(diethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

1-{5-(carboxymethyl)-6-chloro-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl}-L-proline;

2-{4-[(anilinoacetyl)amino]benzyl}-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;

{2-(4-[(benzylamino)carbonyl]amino)benzyl)-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidiny}acetic acid;

{4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(((2-phenylethyl)amino)carbonyl)amino]benzyl]-5-pyrimidinyl}acetic acid;

[4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-[[2-(naphthylamino)carbonyl]amino]benzyl)-5-pyrimidinyl]acetic acid;

{4,6-bis(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

[4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;

[4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl]acetic acid;

{4-(dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;

and their tautomeric and stereoisomeric form, and salts thereof.

[0015] The pyrimidinylacetic acid derivative of the formula (I) shows excellent CRTH2 antagonistic activity. They are, therefore, suitable especially for the prophylaxis and treatment of diseases associated with CRTH2 activity.

[0016] More specifically, the pyrimidinylacetic acid derivative of the formula (I) are effective for the treatment or prevention of allergic diseases such as asthma, allergic rhinitis, atopic dermatitis and allergic conjunctivitis.

[0017] Compounds of the formula (I) are also useful for the treatment or prevention of diseases such as Churg-Strauss syndrome, sinusitis, basophilic leukemia, chronic urticaria and basophilic leukocytosis, since such diseases are also related to CRTH2 activity.

[0018] Further, the present invention provides a medicament, which includes one of the compounds, described above and optionally pharmaceutically acceptable excipients.

[0019] The Alkyl per se and "alk" and "alkyl" in alkoxy, alkanoyl, alkylamino, alkylaminocarbonyl, alkylaminosulphonyl, alkylsulphonylamino, alkoxy carbonyl, alkoxy carbonylamino and alkanoylamino represent a linear or branched alkyl radical having generally 1 to 6, preferably 1 to 4 and particularly preferably 1 to 3 carbon atoms, representing illustratively and preferably methyl, ethyl, n-propyl, isopropyl, tert-butyl, n-pentyl and n-hexyl.

[0020] Alkoxy illustratively and preferably represents methoxy, ethoxy, n-propoxy, iso-propoxy, tert-butoxy, n-pentoxy and n-hexoxy.

[0021] Alkanoyl illustratively and preferably represents acetyl and propanoyl.

[0022] Alkylamino represents an alkylamino radical having one or two (independently selected) alkyl substituents, illustratively and preferably representing methylamino, ethylamino, n-propylamino, isopropylamino, tert-butylamino, n-pentylamino, n-hexyl-amino, N,N-dimethylamino, N,N-diethylamino, N-ethyl-N-methylamino, N-methyl-N-n-propylamino, N-isopropyl-N-n-propylamino, N-t-butyl-N-methylamino, N-ethyl-N-n-pentylamino and N-n-hexyl-N-methylamino.

[0023] Alkylaminocarbonyl or alkylcarbamoyl represents an alkylaminocarbonyl radical having one or two (independently selected) alkyl substituents, illustratively and preferably representing methylaminocarbonyl, ethylaminocarbonyl, n-propylaminocarbonyl, isopropylamino-carbonyl, tert-butylaminocarbonyl, n-pentylaminocarbonyl, n-hexylaminocarbonyl, N,N-dimethylaminocarbonyl, N,N-diethylaminocarbonyl, N-ethyl-N-methylaminocarbonyl, N-methyl-N-n-propylaminocarbonyl, N-isopropyl-N-n-propylaminocarbonyl, N-t-butyl-N-methylaminocarbonyl, N-ethyl-N-n-pentylami-

no-carbonyl and N-n-hexyl-N-methylaminocarbonyl.

[0024] Alkylaminosulphonyl represents an alkylaminosulphonyl radical having one or two (independently selected) alkyl substituents, illustratively and preferably representing methylaminosulphonyl, ethylaminosulphonyl, n-propylaminosulphonyl, isopropylaminosulphonyl, tert-butylaminosulphonyl, n-pentylaminosulphonyl, n-hexylaminosulphonyl, N,N-dimethylaminosulphonyl, N,N-diethylaminosulphonyl, N-ethyl-N-methylamino-sulphonyl, N-methyl-N-n-propylaminosulphonyl, N-isopropyl-N-n-propylaminosulphonyl, N-t-butyl-N-methylaminosulphonyl, N-ethyl-N-n-pentylaminosulphonyl and N-n-hexyl-N-methylaminosulphonyl.

[0025] Alkylsulphonylamino illustratively and preferably represents methylsulphonylamino, ethylsulphonylamino, n-propylsulphonylamino, isopropylsulphonylamino, tert-butylsulphonylamino, n-pentylsulphonylamino and n-hexylsulphonylamino.

[0026] Alkoxy carbonyl illustratively and preferably represents methoxycarbonyl, ethoxycarbonyl, n-propoxycarbonyl, isopropoxycarbonyl, tert-butoxycarbonyl, n-pentoxycarbonyl and n-hexoxycarbonyl. Alkoxy carbonylamino illustratively and preferably represents methoxycarbonylamino, ethoxycarbonylamino, n-propoxycarbonylamino, isopropoxycarbonylamino, tert-butoxycarbonylamino, n-pentoxycarbonylamino and n-hexoxycarbonylamino.

[0027] Alkanoylamino illustratively and preferably represents acetylamino and ethylcarbonylamino.

[0028] Cycloalkyl per se and in cycloalkylamino and in cycloalkylcarbonyl represents a cycloalkyl group having generally 3 to 8 and preferably 5 to 7 carbon atoms, illustratively and preferably representing cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl and cycloheptyl.

[0029] Cycloalkylamino represents a cycloalkylamino radical having one or two (independently selected) cycloalkyl substituents, illustratively and preferably representing cyclopropylamino, cyclobutylamino, cyclopentylamino, cyclohexylamino and cycloheptylamino.

[0030] Cycloalkylcarbonyl illustratively and preferably represents cyclopropylcarbonyl, cyclobutylcarbonyl, cyclopentylcarbonyl, cyclohexylcarbonyl and cycloheptylcarbonyl.

[0031] Aryl per se and in arylamino and in arylcarbonyl represents a mono- to tricyclic aromatic carbocyclic radical having generally 6 to 14 carbon atoms, illustratively and preferably representing phenyl, naphthyl and phenanthrenyl.

[0032] Arylamino represents an arylamino radical having one or two (independently selected) aryl substituents, illustratively and preferably representing phenylamino, diphenylamino and naphthylamino.

[0033] Arylcarbonyl illustratively and preferably represents phenylcarbonyl and naphthylcarbonyl.

[0034] Heteroaryl per se and in heteroarylamino and heteroarylcarbonyl represents an aromatic mono- or bicyclic radical having generally 5 to 10 and preferably 5 or 6 ring atoms and up to 5 and preferably up to 4 hetero atoms selected from the group consisting of S, O and N, illustratively and preferably representing thienyl, furyl, pyrrolyl, thiazolyl, oxazolyl, imidazolyl, pyridyl, pyrimidyl, pyridazinyl, indolyl, indazolyl, benzofuranyl, benzothiophenyl, quinolyl, isoquinolyl.

[0035] Heteroarylamino represents an heteroarylamino radical having one or two (independently selected) heteroaryl substituents, illustratively and preferably representing thienylamino, furylamino, pyrrolylamino, thiazolylamino, oxazolylamino, imidazolyl-amino, pyridylamino, pyrimidylamino, pyridazinylamino, indolylamino, indazolylamino, benzofuranylamino, benzothiophenylamino, quinolyl-amino, isoquinolylamino.

[0036] Heteroarylcarbonyl illustratively and preferably represents thienylcarbonyl, furylcarbonyl, pyrrolylcarbonyl, thiazolylcarbonyl, oxazolylcarbonyl, imidazolylcarbonyl, pyridylcarbonyl, pyrimidylcarbonyl, pyridazinylcarbonyl, indolylcarbonyl, indazolylcarbonyl, benzofuranylcarbonyl, benzothiophenylcarbonyl, quinolylcarbonyl, isoquinolylcarbonyl.

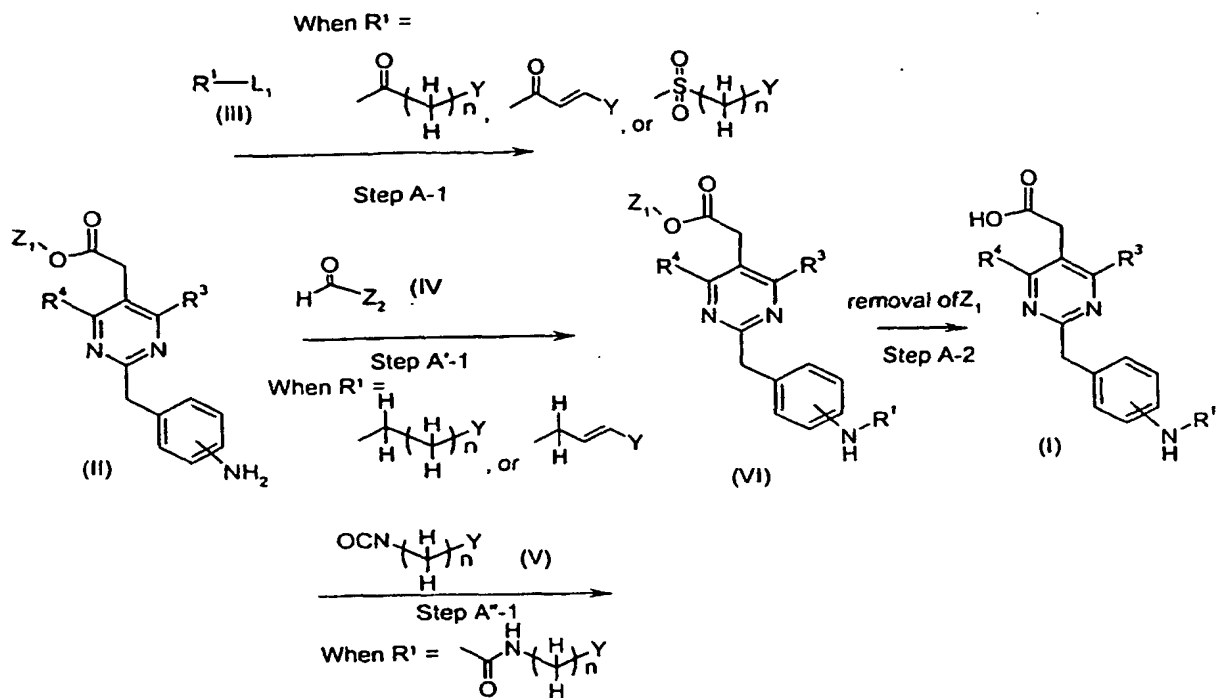
[0037] Heterocyclyl per se and in heterocyclylcarbonyl represents a mono- or polycyclic, preferably mono- or bicyclic, nonaromatic heterocyclic radical having generally 4 to 10 and preferably 5 to 8 ring atoms and up to 3 and preferably up to 2 hetero atoms and/or hetero groups selected from the group consisting of N, O, S, SO and SO₂. The heterocyclyl radicals can be saturated or partially unsaturated. Preference is given to 5- to 8-membered monocyclic saturated heterocyclyl radicals having up to two hetero atoms selected from the group consisting of O, N and S, such as illustratively and preferably tetrahydrofuran-2-yl, pyrrolidin-2-yl, pyrrolidin-3-yl, pyrrolinyl, piperidinyl, morpholinyl, perhydroazepinyl.

[0038] Heterocyclylcarbonyl illustratively and preferably represents tetrahydrofuran-2-carbonyl, pyrrolidine-2-carbonyl, pyrrolidine-3-carbonyl, pyrrolinecarbonyl, piperidinecarbonyl, morpholinecarbonyl, perhydroazepinecarbonyl.

EMBODIMENT OF THE INVENTION

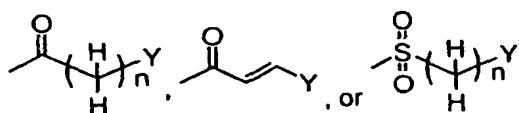
[0039] Compounds of the formula (I) of the present invention can be, but not limited to be, prepared by combining various known methods. In some embodiments, one or more of the substituents, such as amino group, carboxyl group, and hydroxyl group of the compounds used as starting materials or intermediates are advantageously protected by a protecting group known to those skilled in the art. Examples of the protecting groups are described in "Protective Groups in Organic Synthesis (3rd Edition)" by Greene and Wuts, John Wiley and Sons, New York 1999.

[0040] Compounds of the formula (I) of the present invention can be, but not limited to be, prepared by the Method [A], [B] or [C] below.

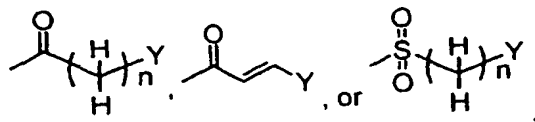
[Method A]

[0041] Compounds of the formula (I) (wherein R^1 , R^3 and R^4 are the same as defined above) can be, for instance, prepared by the following procedures in two steps.

[0042] When R^1 is



(wherein n and Y are the same as defined above), compounds of the formula (VI) (wherein R^3 and R^4 are the same as defined above and Z_1 is C_{1-6} alkyl, benzyl, 4-methoxybenzyl or 3,4-dimethoxybenzyl) can be prepared by the reaction of compounds of the formula (II) (wherein R^3 , R^4 and Z_1 are the same as defined above) with compounds of the formula (III) (wherein R^1 is



in which n and Y are the same as defined above and L_1 represents a leaving group including, for instance, halogen atom such as chlorine, bromine and iodine atom, azole such as imidazole and triazole, and hydroxy) as shown in Step A-1.

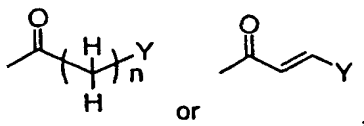
[0043] The reaction may be carried out in a solvent including, for instance, halogenated hydrocarbons such as dichloromethane, chloroform and 1,2-dichloroethane; ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene; nitriles such as acetonitrile; amides such as N , N -dimethylformamide (DMF), N , N -dimethylacetamide (DMAC) and N -methylpyrrolidone

(NMP); urea such as 1,3-dimethyl-2-imidazolidinone (DMI); sulfoxides such as dimethylsulfoxide (DMSO); and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

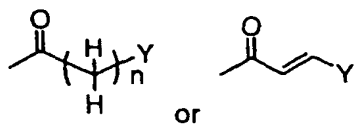
[0044] The reaction temperature is usually, but not limited to, about 0 °C to 180 °C and preferably about 20 °C to 100 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hours to 12 hours.

[0045] The reaction can be advantageously conducted in the presence of a base including, for instance, sodium carbonate, potassium carbonate, pyridine, triethylamine and N,N-diisopropylethylamine, dimethylaniline, diethylaniline, and others.

[0046] In the case L₁ in compounds of the formula (III) (wherein R¹ is



in which n and Y are the same as defined above) represents hydroxy, compounds of the formula (VI) (wherein R³, R⁴ and Z₁ are the same as defined above and R¹ is

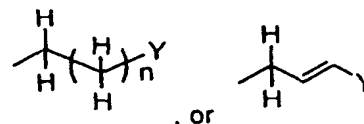


in which n and Y are the same as defined above) can be prepared by the reaction of compounds of the formula (II) (wherein R³, R⁴ and Z₁ are the same as defined above) with compounds of the formula (III) using a coupling agent including, for instance, carbodiimides such as N, N-dicyclohexylcarbodiimide and 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide, benzotriazole-1-yl-oxy-tris-pyrrolidino-phosphonium hexafluorophosphate (PyBOP), diphenylphosphoryl azide, N-hydroxysuccinimide, 1-hydroxybenzotriazole monohydrate (HOBt), and the like can be used as an accelerator of the reaction.

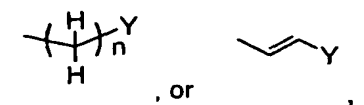
[0047] The reaction may be carried out in a solvent including, for instance, halogenated hydrocarbons such as dichloromethane, chloroform and 1,2-dichloroethane; ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene; nitriles such as acetonitrile; amides such as N, N-dimethylformamide (DMF), N, N-dimethylacetamide (DMAC) and N-methylpyrrolidone (NMP); urea such as 1,3-dimethyl-2-imidazolidinone (DMI); sulfoxides such as dimethylsulfoxide (DMSO); and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

[0048] The reaction temperature is usually, but not limited to, about 0 °C to 180 °C and preferably about 20 °C to 100 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hours to 12 hours.

[0049] When R¹ is



(wherein n and Y are the same as defined above), compounds of the formula (VI) (wherein R³, R⁴ and Z₁ are the same as defined above) can be prepared by the reaction of compounds of the formula (II) (wherein R³, R⁴ and Z₁ are the same as defined above) with compounds of the formula (IV) (wherein Z₂ is



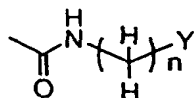
in which n and Y are the same as defined above) using a reducing agent such as sodium triacetoxymethylborohydride, as shown in Step A'-1.

[0050] The reaction can be advantageously conducted in the presence of a Lewis acid such as acetic acid or hydrochloric acid, or a dehydrating agent such as molecular sieves.

[0051] The reaction may be carried out in a solvent including, for instance, halogenated hydrocarbons such as 1,2-dichloroethane, ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene, and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

[0052] The reaction temperature is usually, but not limited to, about 0 °C to 180 °C and preferably about 20 °C to 100 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hours to 12 hours.

[0053] When R¹ is



(wherein n and Y are the same as defined above), compounds of the formula (VI) (wherein R³, R⁴ and Z₁ are the same as defined above) can be prepared by the reaction of compounds of the formula (II) (wherein R³, R⁴ and Z₁ are the same as defined above) with compounds of the formula (V) (wherein n and Y are the same as defined above) as shown in Step A"-1.

[0054] The reaction may be carried out in a solvent including, for instance, halogenated hydrocarbons such as dichloromethane, chloroform and 1,2-dichloroethane; ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene; nitriles such as acetonitrile; amides such as N, N-dimethylformamide (DMF), N, N-dimethylacetamide (DMAC) and N-methylpyrrolidone (NMP); urea such as 1,3-dimethyl-2-imidazolidinone (DMI); sulfoxides such as dimethylsulfoxide (DMSO); and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

[0055] The reaction temperature is usually, but not limited to, about 0 °C to 180 °C and preferably about 20 °C to 100 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hours to 12 hours.

[0056] In Step A-2, compounds of the formula (I) (wherein R¹, R³ and R⁴ are the same as defined above) can be prepared by the removal of protective group Z₁ of compounds of the formula (VI) (wherein R¹, R³, R⁴ and Z₁ are the same as defined above).

[0057] The removal of protective group Z₁ can be conducted by using a base including, for instance, sodium hydroxide, lithium hydroxide and potassium hydroxide, or an acid including, for instance, HCl, HBr, trifluoroacetic acid and BBr₃. The deprotection can also be done by hydrogenation using a catalyst including, for instance, palladium on carbon and palladium hydroxide, when Z₁ is benzyl, 4-methoxybenzyl or 3,4-dimethoxybenzyl. Also, the deprotection can be done by using a reagent such as ceric ammonium nitrate (CAN) or 2,3-dichloro-5,6-dicyano-1,4-benzoquinone (DDQ), when Z₁ is 4-methoxybenzyl or 3,4-dimethoxybenzyl.

[0058] The reaction can be carried out in a solvent including, for instance, halogenated hydrocarbons such as dichloromethane, chloroform and 1,2-dichloroethane; ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene; dimethylformamide (DMF), dimethylacetamide (DMAC), 1,3-dimethyl-3,4,5,6-tetrahydro-2(1H)-pyrimidinone (DMPU), 1,3-dimethyl-2-imidazolidinone (DMI), N-methylpyrrolidinone (NMP), sulfoxides such as dimethylsulfoxide (DMSO), alcohols such as methanol, ethanol, 1-propanol, isopropanol and tert-butanol, water and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

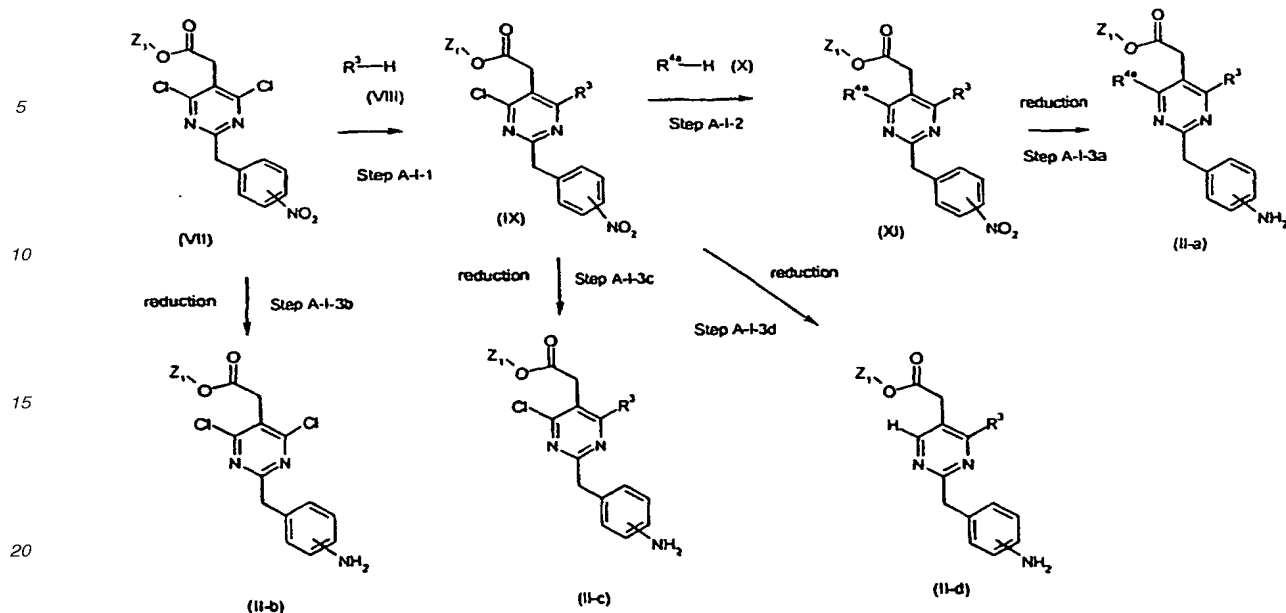
[0059] The reaction temperature is usually, but not limited to, about 0 °C to 200 °C and preferably about 20 °C to 100 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hours to 24 hours.

[0060] Compounds of the formula (III), (IV) and (V) are commercially available or can be synthesized by conventional methods.

Preparation of starting compounds

Procedure A-I

[0061]



[0062] Compounds of the formula (II-a) (wherein R³ and Z₁ are the same as defined above and R^{4a} is C₁₋₆ alkoxy or di(C₁₋₆ alkyl)amino) can be, for instance, prepared by the following procedures.

[0063] In Step A-I-1, compounds of the formula (VII) (wherein Z₁ is the same as defined above) is reacted with compounds of the formula (VIII) (wherein R³ is the same as defined above) to give compounds of the formula (IX) (wherein R³ and Z₁ are the same as defined above).

[0064] The reaction may be carried out without solvent or in a solvent including, for instance, ethers such as diethyl ether, isopropyl ether, dioxane and tetrahydrofuran (THF) and 1,2-dimethoxyethane; aromatic hydrocarbons such as benzene, toluene and xylene; nitriles such as acetonitrile; amides such as N, N-dimethylformamide (DMF), N, N-dimethylacetamide (DMAC) and N-methylpyrrolidone (NMP); urea such as 1,3-dimethyl-2-imidazolidinone (DMI); sulfoxides such as dimethylsulfoxide (DMSO); and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

[0065] The reaction temperature can be optionally set depending on the compounds to be reacted. The reaction temperature is usually, but not limited to, about 20 °C to 120 °C. The reaction may be conducted for, usually, 30 minutes to 60 hours and preferably 1 to 48 hours.

[0066] The reaction can be advantageously carried out in the presence of a base including, for instance, organic amines such as pyridine, triethylamine, N,N-diisopropylethylamine, dimethylaniline, diethylaniline, and others.

[0067] Compounds of the formula (XI) (wherein R³ and Z₁ are the same as defined above and R^{4a} is C₁₋₆ alkoxy or di(C₁₋₆ alkyl)amino) can be prepared by the reaction of compounds of the formula (IX) (wherein R³ and Z₁ are the same as defined above) with compounds of the formula (X) (wherein R^{4a} is C₁₋₆ alkoxy or di(C₁₋₆ alkyl)amino) in a similar manner described in Step A-I-1 for the preparation of compounds of the formula (IX), as shown in Step A-I-2.

[0068] In Step A-I-3a, compounds of the formula (II-a) (wherein R³, R^{4a} and Z₁ are the same as defined above) can be prepared by reducing the nitro group of compounds of the formula (XI) (wherein R³, R^{4a} and Z₁ are the same as defined above) using an agent including, for instance, metals such as zinc and iron in the presence of acid including, for instance, hydrochloric acid and acetic acid and stannous chloride, or by hydrogenation using a catalyst including, for instance, palladium on carbon and platinum on carbon.

[0069] The reaction can be carried out in a solvent including, for instance, ethers such as diethyl ether, isopropyl ether, dioxane, tetrahydrofuran (THF) and 1,2-dimethoxyethane, aromatic hydrocarbons such as benzene, toluene and xylene, alcohols such as methanol, ethanol, 1-propanol, isopropanol and tert-butanol, water and others.

[0070] The reaction temperature can be optionally set depending on the compounds to be reacted. The reaction temperature is usually, but not limited to, about 20 °C to 120 °C. The reaction may be conducted for, usually, 30 minutes to 24 hours and preferably 1 to 12 hours.

[0071] In Step A-I-3b, compounds of the formula (II-b) (wherein Z₁ is the same as defined above) can be prepared by reducing the nitro group of compounds of the formula (VII) (wherein Z₁ is the same as defined above) in a similar manner described in Step A-I-3a for the preparation of compounds of the formula (II-a).

[0072] In Step A-I-3c, compounds of the formula (II-c) (wherein R³ and Z₁ are the same as defined above) can be

prepared by reducing the nitro group of compounds of the formula (IX) (wherein R^3 and Z_1 are the same as defined above) in a similar manner described in Step A-I-3a for the preparation of compounds of the formula (II-a).

[0073] In Step A-I-3d, compounds of the formula (II-d) (wherein R^3 and Z_1 are the same as defined above) can be prepared by reducing the nitro group and the chloro group of compounds of the formula (IX) (wherein R^3 and Z_1 are the same as defined above) by hydrogenation using a catalyst including, for instance, palladium on carbon and platinum on carbon in the presence of a base such as potassium acetate.

[0074] The reaction can be carried out in a solvent including, for instance, ethers such as diethyl ether, isopropyl ether, dioxane, tetrahydrofuran (THF) and 1,2-dimethoxyethane, aromatic hydrocarbons such as benzene, toluene and xylene, alcohols such as methanol, ethanol, 1-propanol, isopropanol and tert-butanol, water and others.

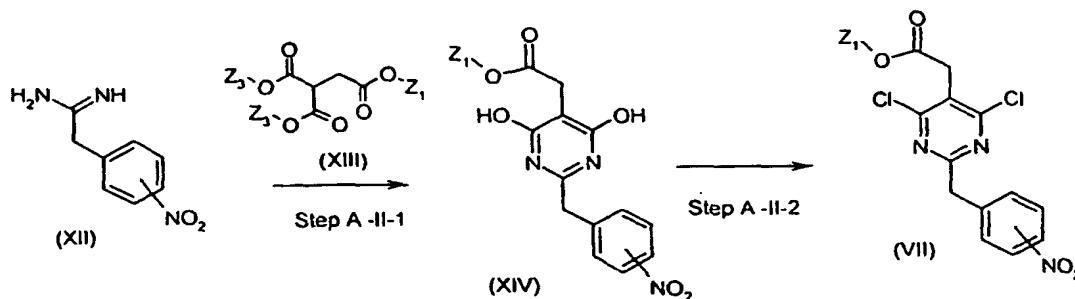
[0075] The reaction temperature can be optionally set depending on the compounds to be reacted. The reaction temperature is usually, but not limited to, about 20 °C to 120 °C. The reaction may be conducted for, usually, 30 minutes to 24 hours and preferably 1 to 12 hours.

[0076] Compounds of the formula (VIII) and (X) are commercially available or can be synthesized by conventional methods.

Preparation of compounds of the formula (VII)

[0077]

Procedure A-II



[0078] Compounds of the formula (VII) (wherein Z_1 is the same as defined above) can be, for instance, prepared by the following procedures.

[0079] In Step A-II-1, compounds of the formula (XII) is reacted with compounds of the formula (XIII) (wherein Z_1 is the same as defined above and Z_3 is C_{1-6} alkyl) to give compounds of the formula (XIV) (wherein Z_1 is the same as defined above).

[0080] The reaction may be carried out in a solvent including, for instance, alcohols such as methanol, ethanol, 1-propanol, isopropanol and *tert*-butanol.

[0081] The reaction temperature can be optionally set depending on compoundss to be reacted. The reaction temperature is usually, but not limited to, about 20 °C to 120 °C. The reaction may be conducted for, usually, 30 minutes to 30 hours and preferably 1 to 24 hours.

[0082] The reaction can be advantageously carried out in the presence of a base such as sodium methoxide.

[0083] In Step A-II-2, compounds of the formula (VII) (wherein Z_1 is the same as defined above) can be can be prepared for instance, by the reaction of compounds of the formula (XIV) (wherein Z_1 is the same as defined above) with an appropriate halogenating reagent including, for instance, $POCl_3$, PCl_5 , and the like;

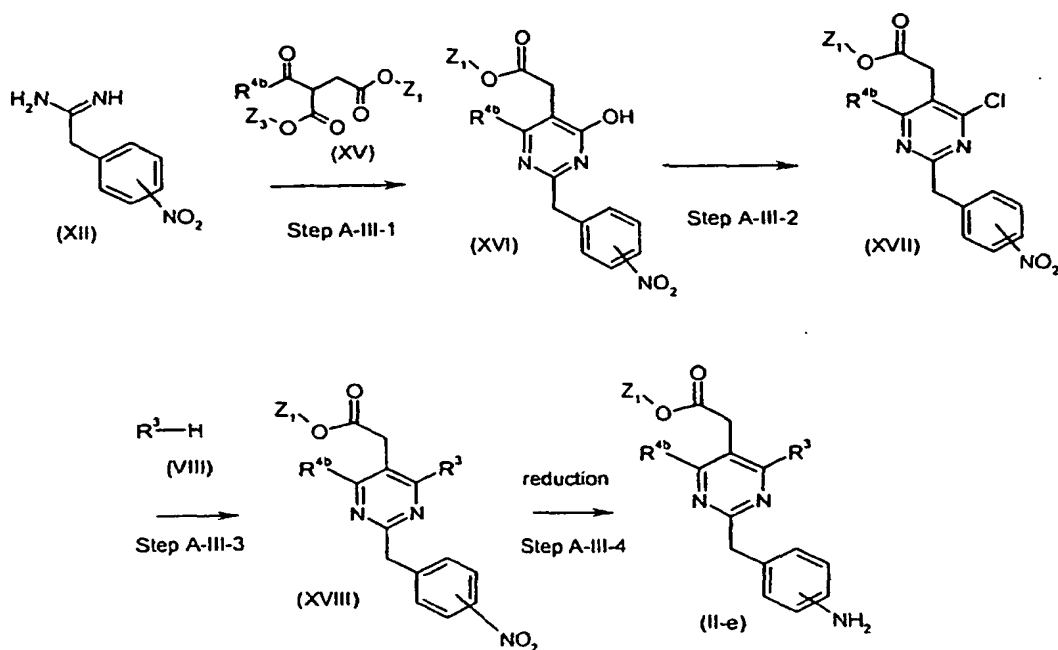
[0084] The reaction may be carried out without solvent or in a solvent including, for instance, halogenated hydrocarbons such as dichloromethane, chloroform and 1,2-dichloroethane, aromatic hydrocarbons such as benzene, toluene, and xylene, and others. Optionally, two or more of the solvents selected from the listed above can be mixed and used.

[0085] The reaction can be advantageously conducted in the presence of a base, including, for instance, pyridine, triethylamine and N,N-diisopropylethylamine, N, N-dimethylaniline, diethylaniline, and others.

[0086] The reaction temperature is usually, but not limited to, about 40 °C to 200 °C and preferably about 20 °C to 180 °C. The reaction may be conducted for, usually, 30 minutes to 48 hours and preferably 2 hour to 12 hours.

[0087] Compounds of the formula (XII) and (XIII) are commercially available or can be synthesized by conventional methods.

Procedure A-III



[0088] Compounds of the formula (II-e) (wherein R^3 and Z_1 are the same as defined above and R^{4b} is C_{1-6} alkyl optionally substituted by mono-, di-, or tri- halogen) can be, for instance, prepared by the following procedures.

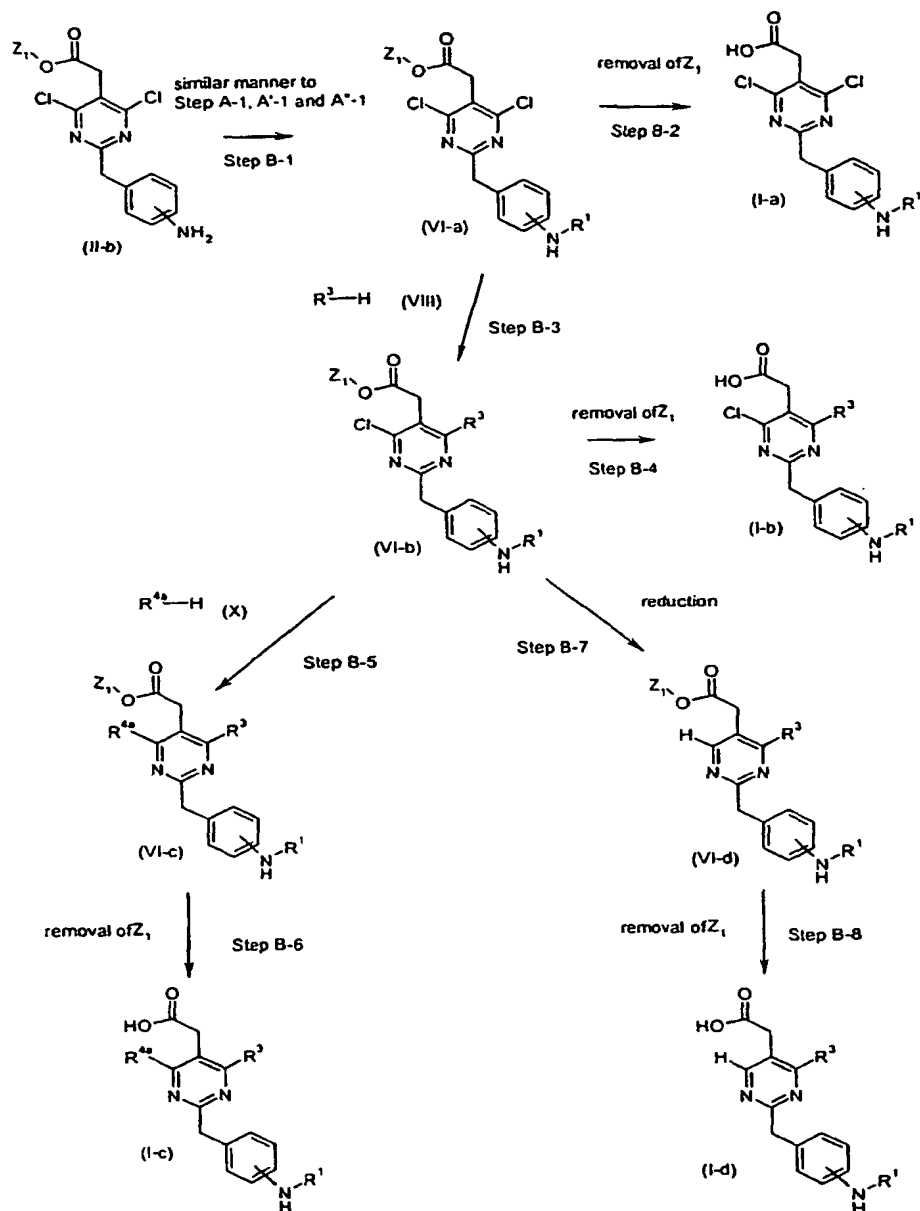
[0089] In Step A-III-1, compounds of the formula (XVI) (wherein R^{4b} and Z_1 are the same as defined above) can be prepared by the reaction of compounds of the formula (XII) and compounds of the formula (XV) (wherein R^{4b} , Z_1 and Z_3 are the same as defined above) in a similar manner described in Step A-II-1 for the preparation of compounds of the formula (XIV).

[0090] In Step A-III-2, compounds of the formula (XVII) (wherein R^{4b} and Z_1 are the same as defined above) can be prepared by the reaction of compounds of the formula (XVI) (wherein R^{4b} and Z_1 are the same as defined above) with an appropriate halogenating reagent in a similar manner described in Step A-II-2 for the preparation of compounds of the formula (VII).

[0091] In Step A-III-3, compounds of the formula (XVIII) (wherein R^3 , R^{4a} and Z_1 are the same as defined above) can be prepared by the reaction of compounds of the formula (XVII) (wherein R^{4b} and Z_1 are the same as defined above) with compounds of the formula (VIII) (wherein R^3 is the same as defined above) in a similar manner described in Step A-I-1 for the preparation of compounds of the formula (IX).

[0092] In Step A-III-4, compounds of the formula (II-e) (wherein R^3 , R^{4a} and Z_1 are the same as defined above) can be prepared by reducing the nitro group of compounds of the formula (XVIII) (wherein R^3 , R^{4a} and Z_1 are the same as defined above) in a similar manner described in Step A-I-3a for the preparation of compounds of the formula (II-a).

[0093] Compounds of the formula (XV) is commercially available or can be synthesized by conventional methods.

[Method B]

[0094] Compounds of the formula (I-a) (wherein R^1 is the same as defined above), the formula (I-b) (wherein R^1 and R^3 are the same as defined above), the formula (I-c) (wherein R^1 , R^3 and R^{4a} are the same as defined above) and the formula (I-d) (wherein R^1 and R^3 are the same as defined above) can also be prepared by the following procedures.

[0095] In Step B-1, compounds of the formula (VI-a) (wherein R^1 and Z_1 are the same as defined above) can be prepared by the reaction of compounds of the formula (II-b) (wherein Z_1 is the same as defined above) in a similar manner described in Step A-1, A'-1 and A"-1 for the preparation of compounds of the formula (VI).

[0096] In Step B-2, compounds of the formula (I-a) (wherein R^1 is the same as defined above) can be prepared by the removal of protective group Z_1 of compounds of the formula (VI-a) (wherein R^1 and Z_1 are the same as defined above) in a similar manner of Step A-2 for the preparation of compounds of the formula (I).

[0097] In Step B-3, compounds of the formula (IV-b) (wherein R^1 , R^3 and Z_1 are the same as defined above) can be

prepared by the reaction of compounds of the formula (VI-a) (wherein R¹ and Z₁ are the same as defined above) with compounds of the formula (VIII) (wherein R³ is the same as defined above) in a similar manner described in Step A-I-1 for the preparation of compounds of the formula (IX).

[0098] In Step B-4, compounds of the formula (I-b) (wherein R¹ and R³ are the same as defined above) can be prepared by the removal of protective group Z₁ of compounds of the formula (VI-b) (wherein R¹, R³ and Z₁ are the same as defined above) in a similar manner of Step A-2 for the preparation of compounds of the formula (I).

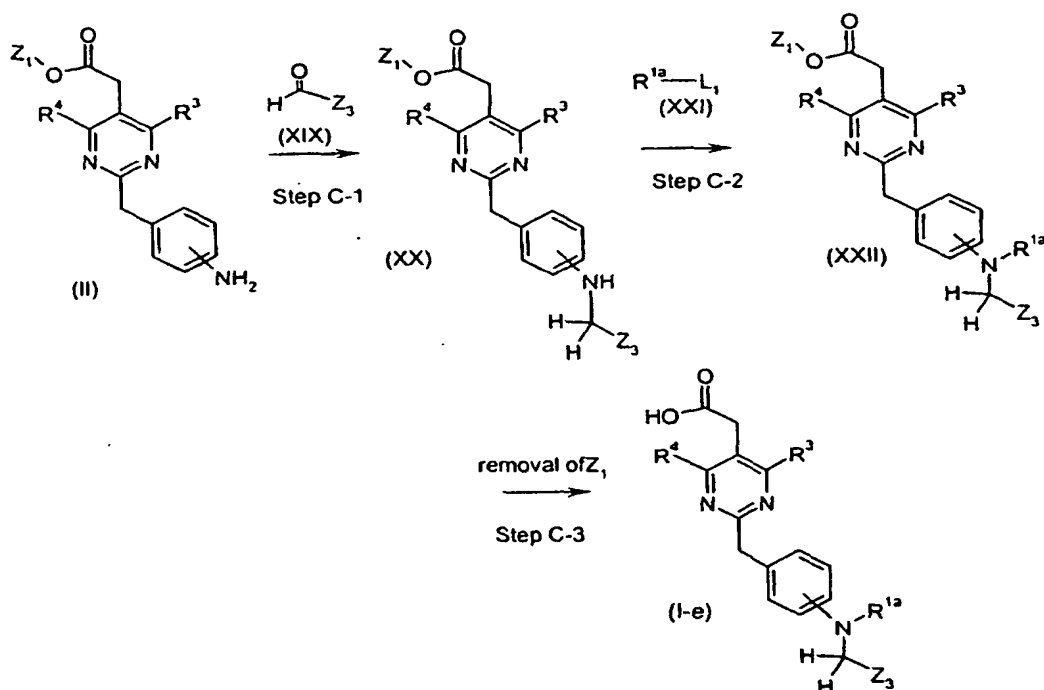
[0099] In Step B-5, compounds of the formula (VI-c) (wherein R¹, R³, R^{4a} and Z₁ are the same as defined above) can be prepared by the reaction of compounds of the formula (VI-b) (wherein R¹, R³ and Z₁ are the same as defined above) with compounds of the formula (X) (wherein R^{4a} is the same as defined above) in a similar manner described in Step A-I-2 for the preparation of compounds of the formula (XI).

[0100] In Step B-6, compounds of the formula (I-c) (wherein R¹, R³ and R^{4a} are the same as defined above) can be prepared by the removal of protective group Z₁ of compounds of the formula (VI-b) (wherein R¹, R³, R^{4a} and Z₁ are the same as defined above) in a similar manner of Step A-2 for the preparation of compounds of the formula (I).

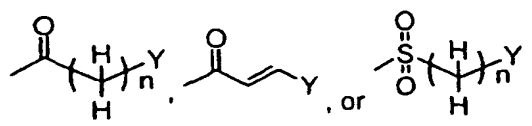
[0101] In Step B-7, compounds of the formula (VI-d) (wherein R¹, R³ and Z₁ are the same as defined above) can be prepared by the reaction of compounds of the formula (VI-b) (wherein R¹, R³ and Z₁ are the same as defined above) in a similar manner described in Step Step A-I-3d for the preparation of compounds of the formula (II-d).

[0102] In Step B-8, compounds of the formula (I-d) (wherein R¹ and R³ are the same as defined above) can be prepared by the removal of protective group Z₁ of compounds of the formula (VI-d) (wherein R¹, R³ and Z₁ are the same as defined above) in a similar manner of Step A-2 for the preparation of compounds of the formula (I).

[Method C]



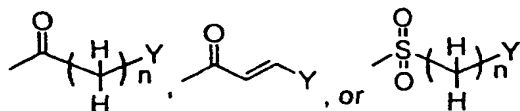
[0103] Compounds of the formula (I-e) (wherein R³ and R⁴ are the same as defined above, R^{1a} represents



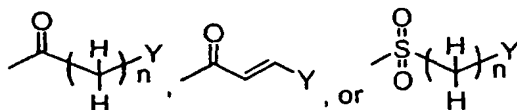
in which n and Y are the same as defined above and Z₃ represents hydrogen or C₁₋₅ alkyl) can also be prepared by the following procedures.

[0104] In Step C-1, compounds of the formula (XX) (wherein R³, R⁴, Z₁ and Z₃ are the same as defined above) can be prepared by the reaction of compounds of the formula (II) (wherein R³, R⁴ and Z₁ are the same as defined above) with compounds of the formula (XIV) (wherein Z₃ is the same as defined above) in a similar manner described in Step A'-I for the preparation of compounds of the formula (VI).

[0105] In Step C-2, compounds of the formula (XXII) (wherein R³, R⁴, Z₁ and Z₃ are the same as defined above and R^{1a} represents



in which n and Y are the same as defined above) can be prepared by the reaction of compounds of the formula (XX) (wherein R³, R⁴, Z₁ and Z₃ are the same as defined above) with compounds of the formula (XXI) (wherein R^{1a} represents



in which n and Y are the same as defined above and L₁ is the same as defined above) in a similar manner described in Step A-I for the preparation of compounds of the formula (VI).

[0106] In Step C-3, compounds of the formula (I-e) (wherein R^{1a}, R³, R⁴ and Z₃ are the same as defined above) can be prepared by the removal of protective group Z₁ of compounds of the formula (XXII) (wherein R^{1a}, R³, R⁴, Z₁ and Z₃ are the same as defined above) in the same manner of Step A-2 for the preparation of compounds of the formula (I).

[0107] Typical salts of the compound shown by the formula (I) include salts prepared by reaction of the compounds of the present invention with a mineral or organic acid, or an organic or inorganic base. Such salts are known as acid addition and base addition salts, respectively.

[0108] Acids to form acid addition salts include inorganic acids such as, without limitation, sulfuric acid, phosphoric acid, hydrochloric acid, hydrobromic acid, hydriodic acid and the like, and organic acids, such as, without limitation, p-toluenesulfonic acid, methanesulfonic acid, oxalic acid, p-bromophenylsulfonic acid, carbonic acid, succinic acid, citric acid, benzoic acid, acetic acid, and the like.

[0109] Base addition salts include those derived from inorganic bases, such as, without limitation, ammonium hydroxide, alkaline metal hydroxide, alkaline earth metal hydroxides, carbonates, bicarbonates, and the like, and organic bases, such as, without limitation, ethanolamine, triethylamine, tris(hydroxymethyl)aminomethane, and the like. Examples of inorganic bases include, sodium hydroxide, potassium hydroxide, potassium carbonate, sodium carbonate, sodium bicarbonate, potassium bicarbonate, calcium hydroxide, calcium carbonate, and the like.

[0110] The compound of the present invention or salts thereof, depending on its substituents, may be modified to form lower alkylesters or known other esters; and/or hydrates or other solvates. Those esters, hydrates, and solvates are included in the scope of the present invention.

[0111] The compound of the present invention may be administered in oral forms, such as, without limitation, normal and enteric coated tablets, capsules, pills, powders, granules, elixirs, tinctures, solution, suspensions, syrups, solid and liquid aerosols and emulsions. They may also be administered in parenteral forms, such as, without limitation, intravenous, intraperitoneal, subcutaneous, intramuscular, and the like forms, well-known to those of ordinary skill in the pharmaceutical arts. The compounds of the present invention can be administered in intranasal form via topical use of suitable intranasal vehicles, or via transdermal routes, using transdermal delivery systems well-known to those of ordinary skilled in the art.

[0112] The dosage regimen with the use of the compounds of the present invention is selected by one of ordinary skill in the arts, in view of a variety of factors, including, without limitation, age, weight, sex, and medical condition of the recipient, the severity of the condition to be treated, the route of administration, the level of metabolic and excretory function of the recipient, the dosage form employed, the particular compound and salt thereof employed.

[0113] The compounds of the present invention are preferably formulated prior to administration together with one or more pharmaceutically-acceptable excipients. Excipients are inert substances such as, without limitation, carriers, dilu-

ents, flavoring agents, sweeteners, lubricants, solubilizers, suspending agents, binders, tablet disintegrating agents and encapsulating material.

[0114] Yet another embodiment of the present invention is pharmaceutical formulation comprising a compound of the invention and one or more pharmaceutically-acceptable excipients that are compatible with the other ingredients of the formulation and not deleterious to the recipient thereof. Pharmaceutical formulations of the invention are prepared by combining a therapeutically effective amount of the compounds of the invention together with one or more pharmaceutically-acceptable excipients therefore. In making the compositions of the present invention, the active ingredient may be mixed with a diluent, or enclosed within a carrier, which may be in the form of a capsule, sachet, paper, or other container. The carrier may serve as a diluent, which may be solid, semi-solid, or liquid material which acts as a vehicle, or can be in the form of tablets, pills, powders, lozenges, elixirs, suspensions, emulsions, solutions, syrups, aerosols, ointments, containing, for example, up to 10% by weight of the active compound, soft and hard gelatin capsules, suppositories, sterile injectable solutions and sterile packaged powders.

[0115] For oral administration, the active ingredient may be combined with an oral, and non-toxic, pharmaceutically-acceptable carrier, such as, without limitation, lactose, starch, sucrose, glucose, sodium carbonate, mannitol, sorbitol, calcium carbonate, calcium phosphate, calcium sulfate, methyl cellulose, and the like; together with, optionally, disintegrating agents, such as, without limitation, maize, starch, methyl cellulose, agar bentonite, xanthan gum, alginic acid, and the like; and optionally, binding agents, for example, without limitation, gelatin, natural sugars, beta-lactose, corn sweeteners, natural and synthetic gums, acacia, tragacanth, sodium alginate, carboxymethylcellulose, polyethylene glycol, waxes, and the like; and, optionally, lubricating agents, for example, without limitation, magnesium stearate, sodium stearate, stearic acid, sodium oleate, sodium benzoate, sodium acetate, sodium chloride, talc, and the like.

[0116] In powder forms, the carrier may be a finely divided solid which is in admixture with the finely divided active ingredient. The active ingredient may be mixed with a carrier having binding properties in suitable proportions and compacted in the shape and size desired to produce tablets. The powders and tablets preferably contain from about 1 to about 99 weight percent of the active ingredient which is the novel composition of the present invention. Suitable solid carriers are magnesium carboxymethyl cellulose, low melting waxes, and cocoa butter.

[0117] Sterile liquid formulations include suspensions, emulsions, syrups and elixirs. The active ingredient can be dissolved or suspended in a pharmaceutically acceptable carrier, such as sterile water, sterile organic solvent, or a mixture of both sterile water and sterile organic solvent.

[0118] The active ingredient can also be dissolved in a suitable organic solvent, for example, aqueous propylene glycol. Other compositions can be made by dispersing the finely divided active ingredient in aqueous starch or sodium carboxymethyl cellulose solution or in a suitable oil.

[0119] The formulation may be in unit dosage form, which is a physically discrete unit containing a unit dose, suitable for administration in human or other mammals. A unit dosage form can be a capsule or tablets, or a number of capsules or tablets. A "unit dose" is a predetermined quantity of the active compound of the present invention, calculated to produce the desired therapeutic effect, in association with one or more excipients. The quantity of active ingredient in a unit dose may be varied or adjusted from about 0.1 to about 1000 milligrams or more according to the particular treatment involved.

[0120] Typical oral dosages of the compound of the present invention, when used for the indicated effects, will range from about 1 mg/kg/day to about 10 mg/kg/day. The compounds of the present invention may be administered in a single daily dose, or the total daily dose may be administered in divided doses, two, three, or more times per day. Where delivery is via transdermal forms, of course, administration is continuous.

EXAMPLES

[0121] The present invention will be described as a form of examples, but they should by no means be construed as defining the metes and bounds of the present invention.

[0122] In the examples below, all quantitative data, if not stated otherwise, relate to percentages by weight.

[0123] Mass spectra were obtained using electrospray (ES) ionization techniques (micromass Platform LC). Melting points are uncorrected. Liquid Chromatography - Mass spectroscopy (LC-MS) data were recorded on a Micromass Platform LC with Shimadzu Phenomenex ODS column (4.6 mm ϕ X 30 mm) flushing a mixture of acetonitrile-water (9:1 to 1:9) at 1 ml/min of the flow rate. TLC was performed on a precoated silica gel plate (Merck silica gel 60 F-254). Silica gel (WAKO-gel C-200 (75-150 μ m)) was used for all column chromatography separations. All chemicals were reagent grade and were purchased from Sigma-Aldrich, Wako pure chemical industries, Ltd., Great Britain, Tokyo kasei kogyo Co., Ltd., Nacalai tesque, Inc., Watanabe Chemical Ind. Ltd., Maybridge plc, Lancaster Synthesis Ltd., Merck KGaA, Germany, Kanto Chemical Co., Ltd.

[0124] ^1H NMR spectra were recorded using either Bruker DRX-300 (300 MHz for ^1H) spectrometer or Bruker 500 UltraShieldTM (500 MHz for ^1H). Chemical shifts are reported in parts per million (ppm) with tetramethylsilane (TMS) as an internal standard at zero ppm. Coupling constant (J) are given in hertz and the abbreviations s, d, t, q, m, and br

refer to singlet, doublet, triplet, quartet, multiplet, and broad, respectively. The mass determinations were carried out by MAT95 (Finnigan MAT).

[0125] All starting materials are commercially available or can be prepared using methods cited in the literature.

[0126] The effect of the present compounds was examined by the following assays and pharmacological tests.

EXAMPLE 1

[Preparation of human CRTH2-transfected L1.2 cell line]

[0127] Human CRTH2 cDNA was amplified from human eosinophil cDNA with gene specific primers containing restriction sites for cloning into pEAK vector (Edge Bio Systems). The human CRTH2 cDNA was cloned into the mammalian expression vector pEAK. This expression plasmid (40 μ g) was transfected into L1.2 cells, at a cell density of 1×10^7 cells/500 μ l, by using electroporation apparatus (Gene Pulser II, BioRad) at 250V/1,000 μ F. One day after the transfection, puromycin (1 μ g/ml, Sigma) was added into the cell culture plates. Two weeks after the transfection, grown cells were picked up for further growth.

[Measurement of Ca^{2+} mobilization in the human CRTH2-transfected L1.2 cell line] (Assay 1)

[0128] Ca^{2+} loading buffer was prepared by mixing 5 μ l of Fluo-3AM (2 mM in DMSO, final 1 μ M, Molecular Probes) and 10 μ l of pluronic F-127 (Molecular Probes) and diluting the resulting mixture in 10 ml of Ca^{2+} assay buffer (20 mM HEPES pH 7.6, 0.1% BSA, 1 mM probenecid, Hanks' solution). The CRTH2 transfected cells which were prepared in Example 1 were washed with PBS, resuspended in Ca^{2+} loading buffer at 1×10^7 cells/ml, and incubated for 60 min at room temperature. After incubation, cells were washed and resuspended in Ca^{2+} assay buffer, then dispensed into transparent-bottom 96-well plates (#3631, Costar) at 2×10^5 cells/well. Cells were incubated with various concentrations of test compound for 5 minutes at room temperature. The emitted 480 nm fluorescence was measured on FDSS6000, a Ca^{2+} - measurement apparatus (Hamamatsu Photonics, Hamamatsu, Japan). The transfectant showed PGD₂-induced Ca^{2+} mobilization in a concentration-dependent manner.

[human CRTH2 receptor binding assay] (Assay 2)

[0129] CRTH2 transfectants were washed once with PBS and resuspended in binding buffer (50 mM Tris-HCl, pH7.4, 40 mM MgCl₂, 0.1% BSA, 0.1% NaN₃). 100 μ l of cell suspension (2×10^5 cells), [³H]-labeled PGD₂, and various concentrations of test compound were then mixed in a 96-well U-bottom polypropylene plate and incubated for 60 min at room temperature to allow binding to occur. After incubation, the cell suspension was transferred to a filtration plate (#MAFB, Millipore) and washed 3 times with binding buffer. Scintillant was added to the filtration plate, and radioactivity remaining on the filter was measured by TopCount (Packard), a scintillation counter. Non-specific binding was determined by incubating the cell suspension and [³H]-labeled PGD₂ in the presence of 1 μ M of unlabeled PGD₂. Puromycin-resistant L1.2 transfectants bound to [³H]-labeled PGD₂ with high affinity ($K_D = 6.3$ nM).

[Migration assay of human eosinophils] (Assay 3)

[0130] Human polymorphonuclear cells were isolated from heparinized venous blood of healthy donors by laying the blood on Mono-Poly Resolving Medium (ICN Biomedicals, Co.Ltd) and centrifuging it at 400 x g for 30 min. at room temperature. After centrifugation, eosinophils were purified from the lower layer of polymorphonuclear cells by CD16-negative selection using anti-CD16-conjugated magnetic beads (Miltenyi Biotech GmbH).

[0131] Human eosinophils were washed with PBS and resuspended in chemotaxis buffer (20 mM HEPES pH 7.6, 0.1% BSA, Hanks' solution) at 6×10^5 cells/ml. Fifty μ l of the cell suspension (3×10^5 cells/well) was then dispensed into the upper chamber and 30 μ l of ligand solution (PGD₂, 1 nM, final concentration) was added to the lower chamber of a 96-well chemotaxis chamber (Diameter = 5 μ m, #106-5, Neuro Probe). Cells were preincubated with various concentrations of test compound at 37 °C for 10 minutes. Chemotaxis is then allowed to occur in a humidified incubator at 37 °C, 5% CO₂ for 2 hours. The number of cells migrating into the lower chamber was counted by FACScan (Becton-Dickinson).

[Migration assay of human CD4+ T cells] (Assay 4)

[0132] Human mononuclear cells were isolated from heparinized venous blood of healthy donors by laying the blood on Mono-Poly Resolving Medium (ICN Biomedicals, Co.Ltd) and centrifuging it at 400 x g for 30 min. at room temperature. After centrifugation, CD4+ T lymphocytes were purified from mononuclear cells by using CD4+ T cell isolation kit (Miltenyi

Biotec GmbH).

[0133] Human CD4⁺ T lymphocytes were washed with PBS and resuspended in chemotaxis buffer (20 mM HEPES pH 7.6, 0.1% BSA, Hanks' solution) at 6×10^6 cells/ml. Fifty μ l of the cell suspension (3×10^5 cells/well) was then dispensed into the upper chamber and 30 μ l of ligand solution (PGD₂, 10 nM, final concentration) was added to the lower chamber of a 96-well chemotaxis chamber (Diameter = 3 mm, #106-3, Neuro Probe). Cells were preincubated with various concentrations of test compound at 37 °C for 10 minutes. Chemotaxis is then allowed to occur in a humidified incubator at 37 °C, 5% CO₂ for 4 hours. The number of cells migrating into the lower chamber was counted by FACScan (Becton-Dickinson).

[0134] Assay results in Assay 1 are shown in Examples and tables of the Examples below. The data corresponds to the compounds as yielded by solid phase synthesis and thus to levels of purity of about 40 to 90%. For practical reasons, the compounds are grouped in four classes of activity as follows:

$$IC_{50} = A (< \text{ or } =) \text{ nM} < B (< \text{ or } =) 0.5 \text{ nM} < C (< \text{ or } =) 1 \text{ nM} < D$$

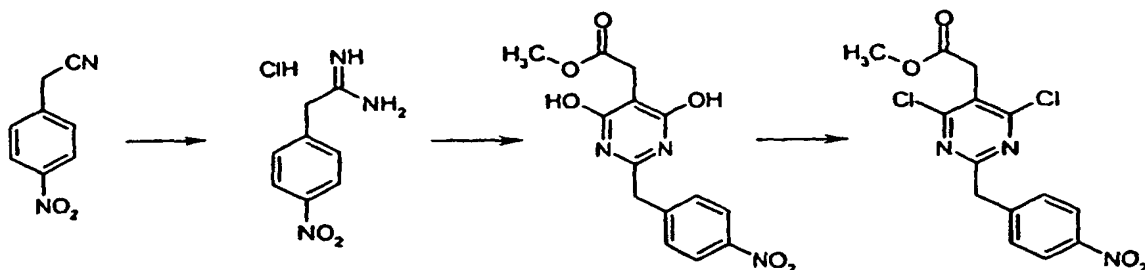
[0135] The compounds of the present invention also show excellent selectivity, and potent activity in Assays 2, 3 and 4 described above.

[0136] z used in Melting point in the following section indicates decomposition. All inorganic acids and bases were aqueous solutions unless otherwise stated. Eluent concentrations are expressed as %vol./vol.

Preparation of compounds

Methyl [4,6-dichloro-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate

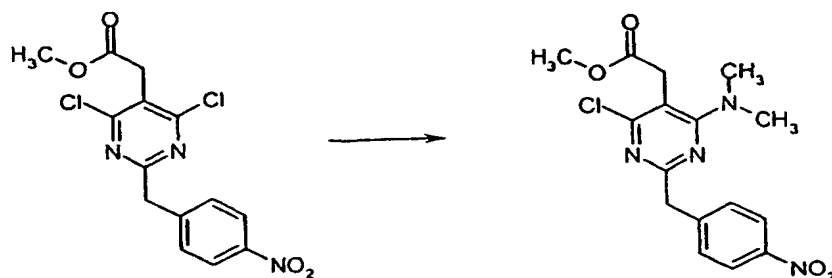
[0137]



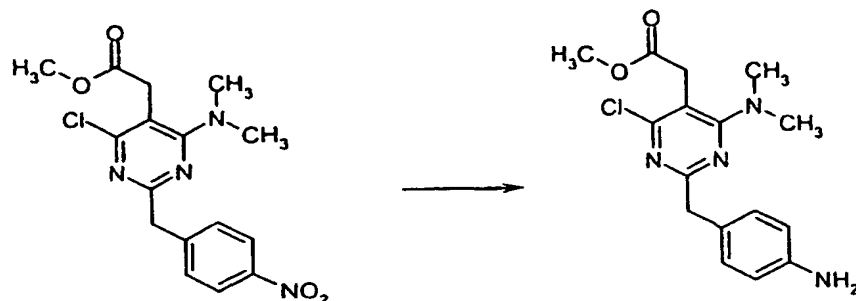
4-Nitrophenyl acetonitrile (81.07 g, 500 mmol) was suspended in EtOH (300 mL) and dioxane (300 mL) was added. After all solids had dissolved, dry HCl gas was bubbled through the reaction mixture for 1 h and then stirred at r.t. for 15 h. Et₂O was then added and the separated solids were collected by suction and rinsed with Et₂O. This intermediate was dissolved in NH₃ saturated EtOH and the solution thus obtained was stirred at r.t. for 14 h. Excess solvent was removed *in vacuo* to give 2-(4-nitrophenyl)ethanimidamide hydrochloride (73.65 g, 68% yield) as a white powder.

[0138] To a mixture of triethyl 1,1,2-ethanetricarboxylate (3.51 mL, 15.30 mmol) and 2-(4-nitrophenyl)ethanimidamide hydrochloride (46.95 g, 217.72 mmol) in anhydrous MeOH (300 mL) at r.t. was added NaOMe (38.82 g, 718.49 mmol) and the resulting suspension was refluxed for 16 h. After cooling to r.t., the reaction mixture was chilled to 0 °C, acidified with 6N HCl, and the separated solids collected by suction and rinsed with cold water. Drying under high vacuum at 45 °C for 6 h then gave methyl [4,6-dihydroxy-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (56.48 g, 81% yield) as a pale white powder.

[0139] To a suspension of methyl [4,6-dihydroxy-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (4.12 g, 12.89 mmol) in POCl₃ (24 mL) at r.t. and under Ar atmosphere was added *N,N*-dimethylaniline (8.17 mL, 64.44 mmol) and the resulting dark suspension was heated at reflux for 16 h. After cooling to r.t., excess POCl₃ was evaporated and the remaining dark residue was dissolved in EtOAc. This organic layer was then washed sequentially with saturated NaHCO₃, water, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was dissolved in CH₂Cl₂ and passed through a short plug of silica gel to afford pure methyl [4,6-dichloro-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (2.98 g, 65% yield) as an off-white powder.

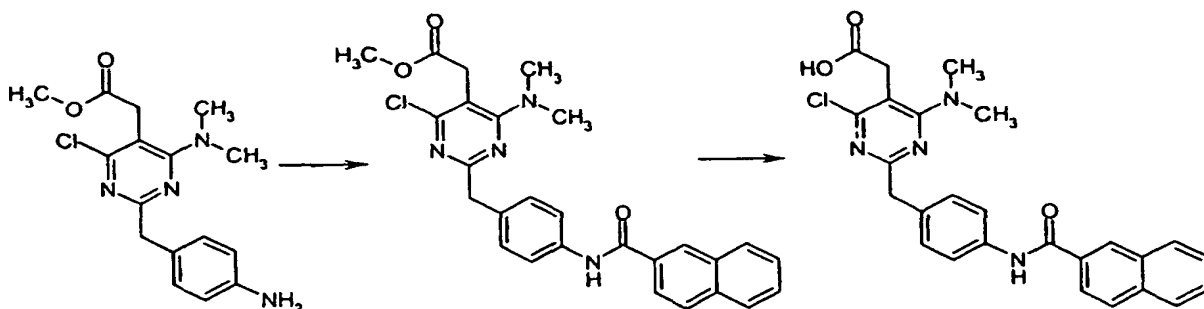
Methyl [4-chloro-6-(dimethylamino)-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate**[0140]**

[0141] To a solution of methyl [4,6-dichloro-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (0.5 g, 1.40 mmol) in anhydrous DMF (5 mL) at r.t. under Ar atmosphere was added *N,N*-diisopropylethylamine (0.054 mL, 3.09 mmol) and dimethylamine hydrochloride (0.126 g, 1.54 mmol). The resulting solution was stirred at 85 °C for 16 h at which time the reaction mixture was concentrated to dryness and the residue chromatographed over silica gel eluting with 50% EtOAc in *n*-hexane to give methyl [4-chloro-6-(dimethylamino)-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (0.505 g, 99% yield) as a brown oil.

Methyl [2-(4-aminobenzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetate**[0142]**

[0143] A solution of methyl [4-chloro-6-(dimethylamino)-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (1.00 g, 2.74 mmol) in anhydrous THF (20 mL) at r.t. was treated with 10% Pd/C (0.100 g) and the resulting black suspension was stirred under an atmosphere of hydrogen. After 13 h, the reaction mixture was filtered over Celite. Evaporation of the filtrate gave the crude product as a clear oil which was passed through a short column eluting with 40% EtOAc in *n*-hexane to give methyl [2-(4-aminobenzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetate (0.876 g, 95% yield) as a light orange oil which slowly solidified upon standing at r.t.

Example 1-1**{4-Chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid****[0144]**



[0145] To a mixture of methyl [2-(4-aminobenzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetate (0.090 g, 0.30 mmol) and PyBOP (0.187 g, 0.36 mmol) in anhydrous DMF (1 mL) at r.t. was added 2-naphthoic acid (0.062 g, 0.36 mmol). The resulting reaction mixture was stirred at r.t. for 3 h at which time water was added and the resulting aqueous phase was extracted with EtOAc. The combined organic extracts were sequentially washed with 0.5N HCl, saturated NaHCO₃, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo* to give methyl {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate as a colorless oil.

[0146] The thus obtained methyl {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate was dissolved in THF (1 mL) and treated with 1N NaOH (0.5 mL). The resulting biphasic mixture was stirred at r.t. for 14 h at which time it was poured into water. The separated aqueous phase was washed with EtOAc and then acidified with 1N HCl and back extracted with EtOAc. The combined organic extracts were washed with brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was dissolved in a minimum volume of THF to which *n*-hexane was added. The separated precipitate was collected by suction, rinsed with *n*-hexane, and dried under vacuum to give {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid (0.038 g, 40% yield) as a white powder.

[0147] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 3.05 (s, 6H), 3.67 (s, 2H), 3.93 (s, 2H), 7.32 (d, J=8 Hz, 2H), 7.59-7.68 (m, 2H), 7.75 (d, J=8 Hz, 2H), 8.00-8.10 (m, 4H), 8.57 (s, 1H), 10.40 (s, 1H), 12.77 (bs, 1H).

Molecular weight: 474.95

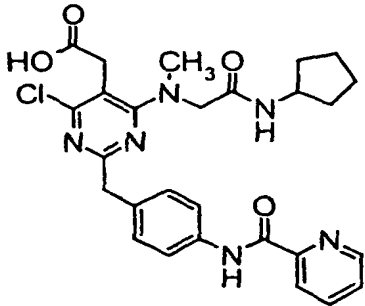
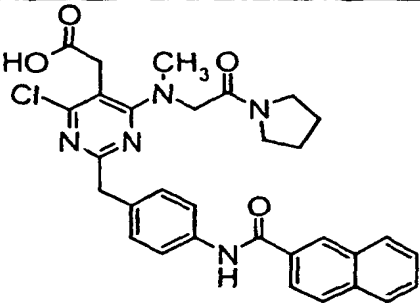
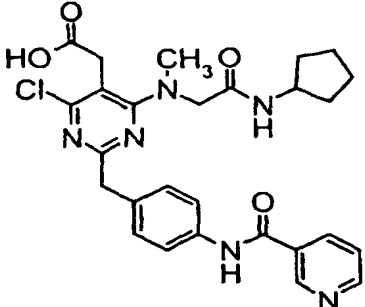
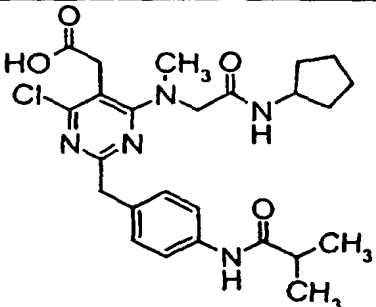
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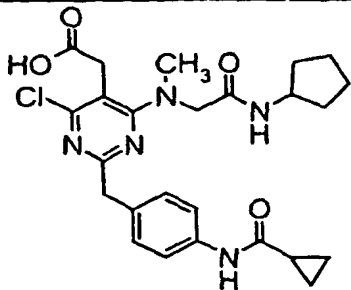
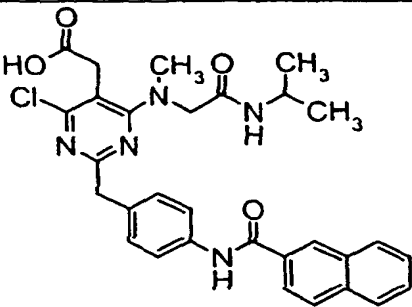
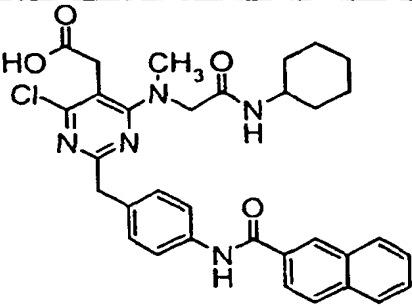
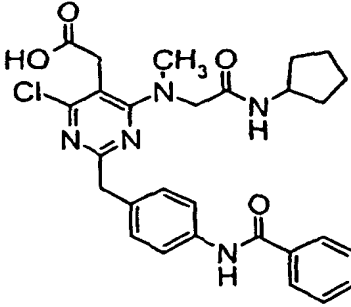
Melting point: 188 Z °C

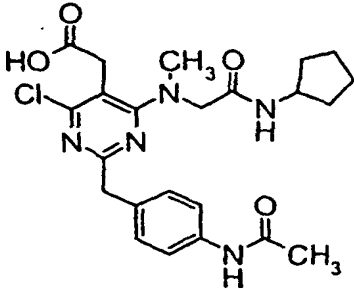
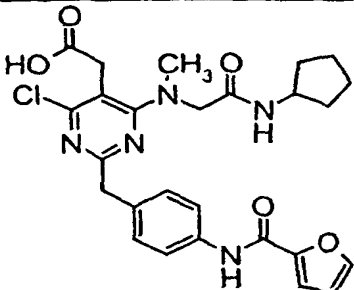
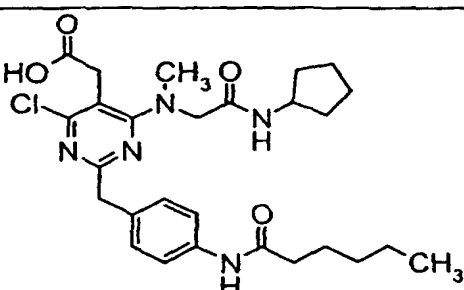
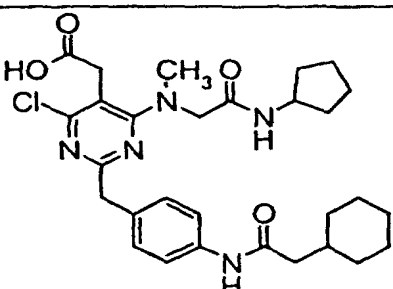
Activity class: A

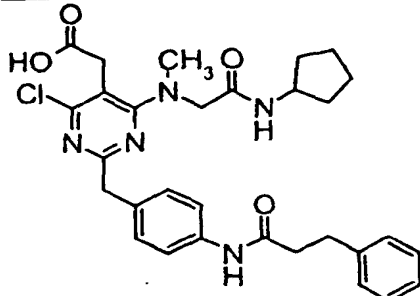
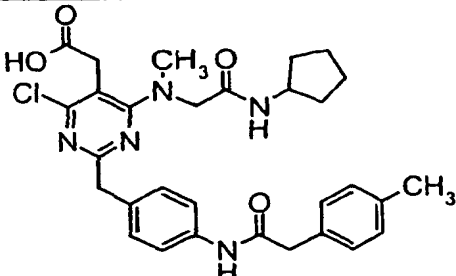
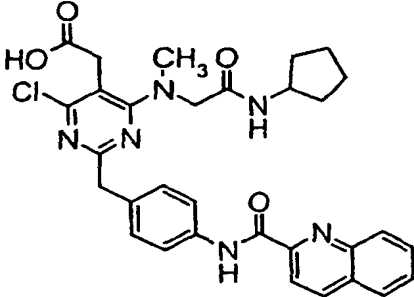
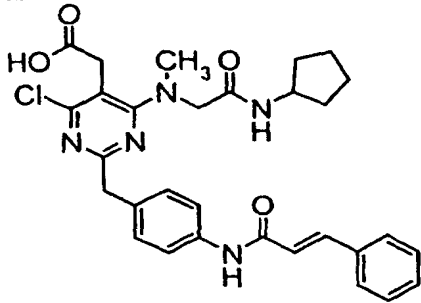
[0148] In a similar manner as described in Example 1-1, compounds in Example 1-2 to 1-62 as shown in Table 1 were synthesized.

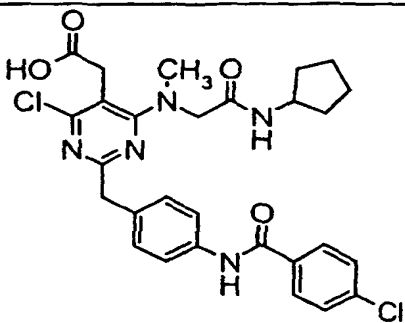
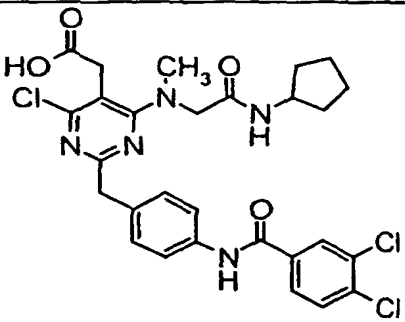
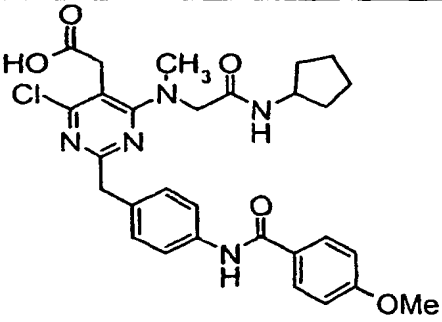
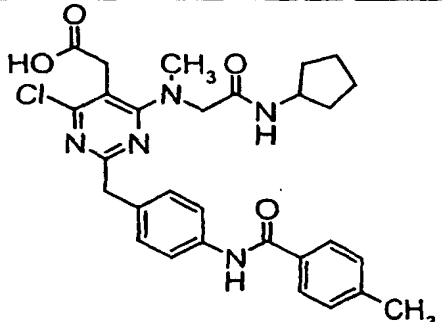
Table 1

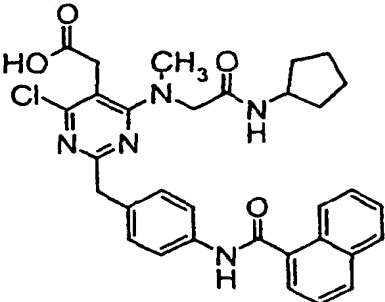
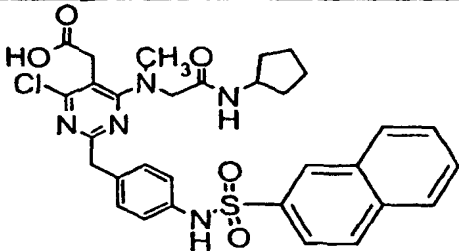
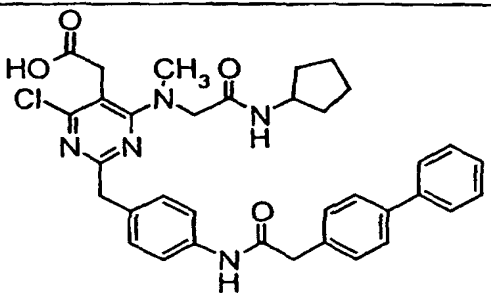
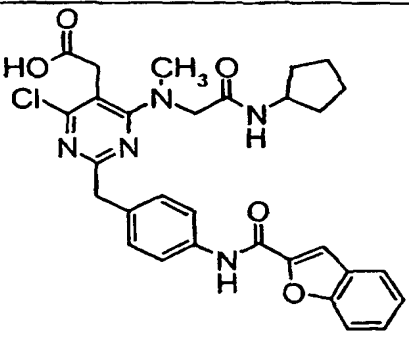
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-2 |  | 537,02 | 536 | 537 | >135 Z | D |
| 1-3 |  | 572,07 | 571 | 572 | 177 Z | A |
| 1-4 |  | 537,02 | 536 | 537 | >174 Z | D |
| 1-5 |  | 502,02 | 501 | 502 | >142 Z | D |

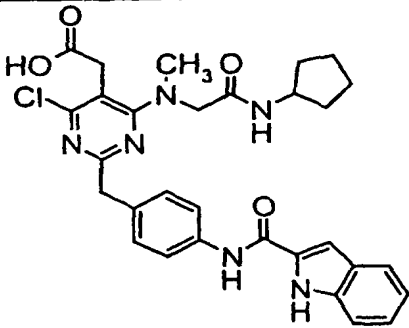
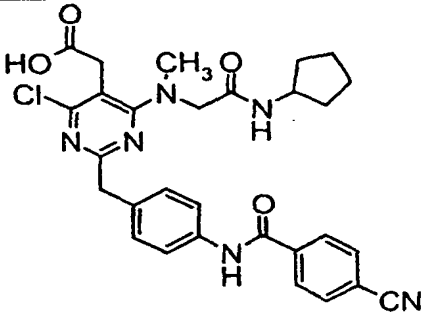
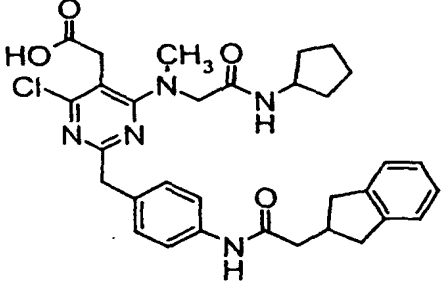
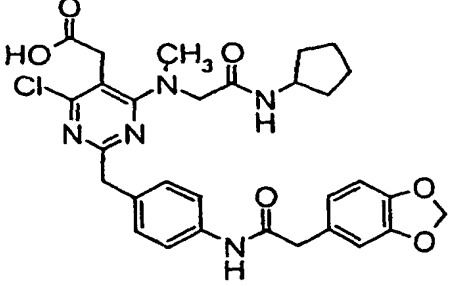
| ex-ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|-------------|---|--------|------------|-----|---------|----------------|
| 1-6 |  | 500,00 | 499 | 500 | >146 Z | D |
| 1-7 |  | 560,06 | 559 | 560 | 181 Z | A |
| 1-8 |  | 600,12 | 599 | 600 | 134 Z | A |
| 1-9 |  | 536,04 | 535 | 536 | >140 Z | B |

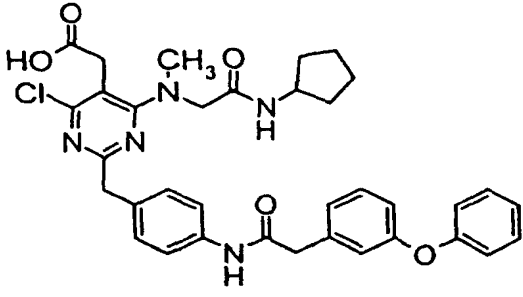
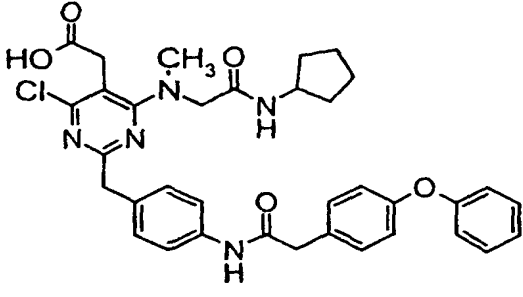
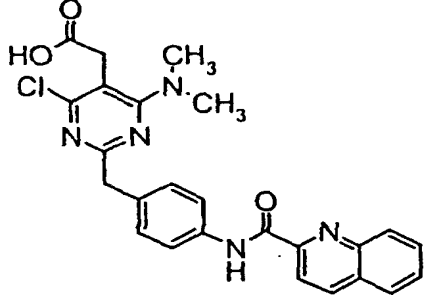
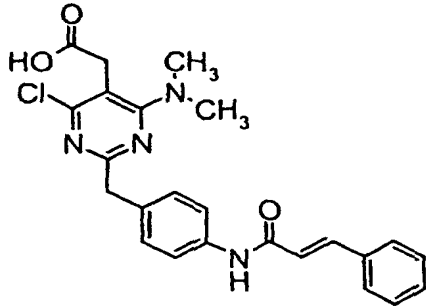
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|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-10 |  | 473,96 | 473 | 474 | >118 Z | D |
| 1-11 |  | 526,00 | 525 | 526 | >119 Z | C |
| 1-12 |  | 530,07 | 529 | 530 | >100 Z | C |
| 1-13 |  | 556,11 | 555 | 556 | >149 Z | B |

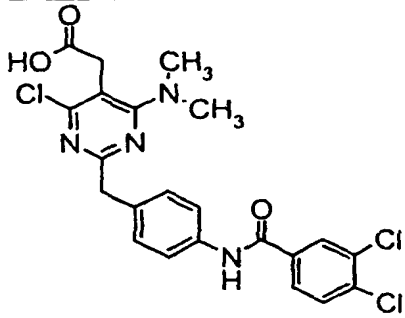
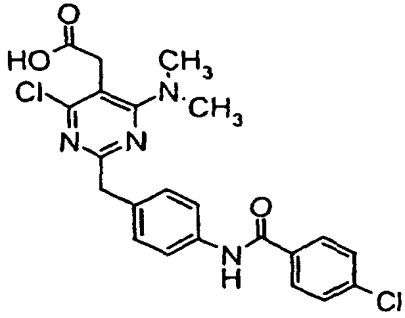
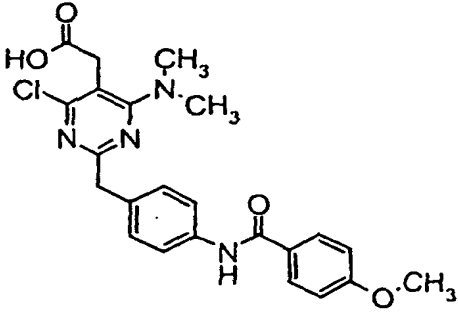
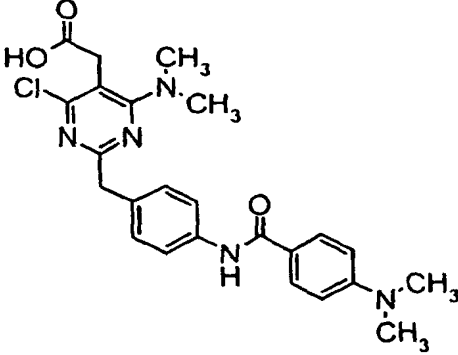
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-14 |  | 564,09 | 563 | 564 | >139 Z | A |
| 1-15 |  | 564,09 | 563 | 564 | >116 Z | B |
| 1-16 |  | 587,08 | 586 | 587 | 137 Z | A |
| 1-17 |  | 562,07 | 561 | 562 | 142 Z | A |

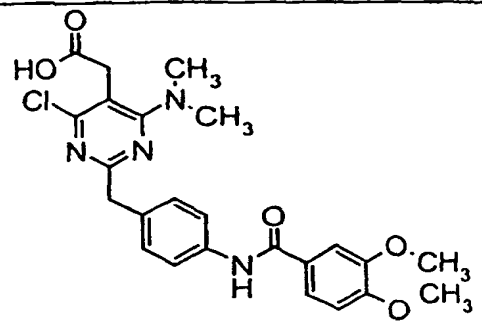
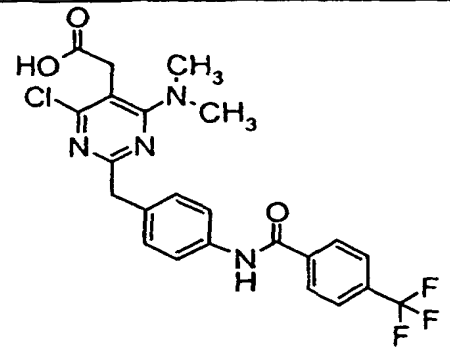
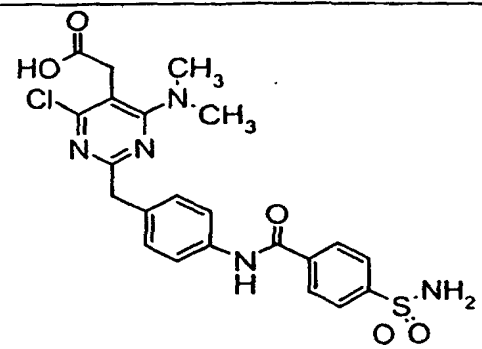
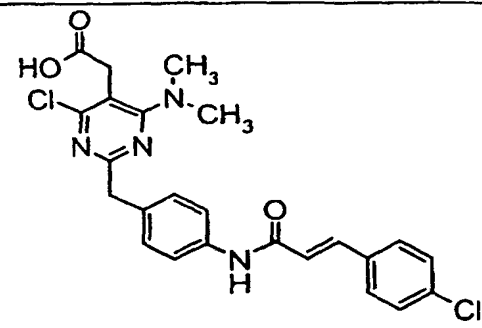
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|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-18 |  | 570,48 | 569 | 570 | 143 Z | A |
| 1-19 |  | 604,93 | 603 | 604 | 144 Z | A |
| 1-20 |  | 566,06 | 565 | 566 | 104 Z | A |
| 1-21 |  | 550,06 | 549 | 550 | 125 Z | A |

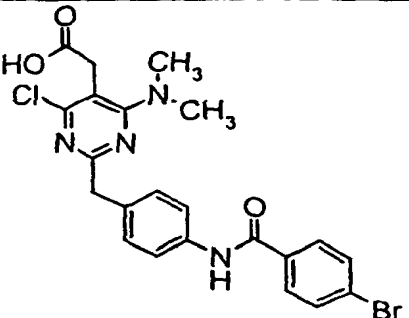
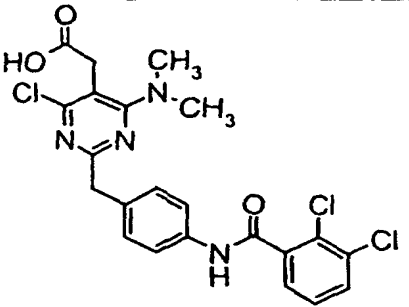
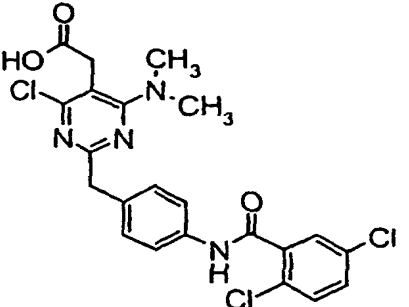
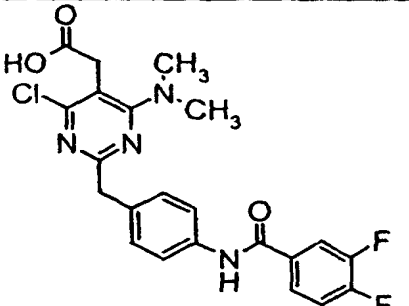
| ex-ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|-------------|---|--------|------------|--------|---------|----------------|
| 1-22 |  | 586,10 | 585 | 586 | 136 Z | B |
| 1-23 |  | 622,15 | 621,00 | 622,00 | 116 Z | D |
| 1-24 |  | 626,16 | 625,00 | 626,00 | 124 Z | C |
| 1-25 |  | 576,06 | 575 | 576 | 118 Z | A |

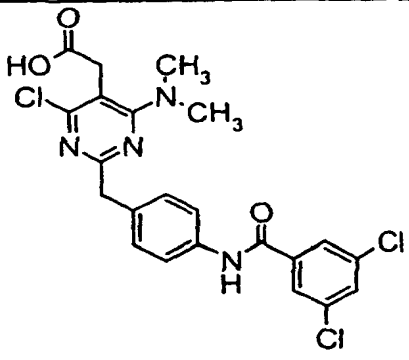
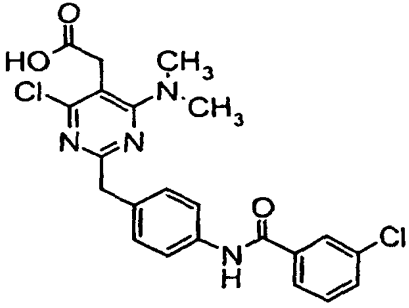
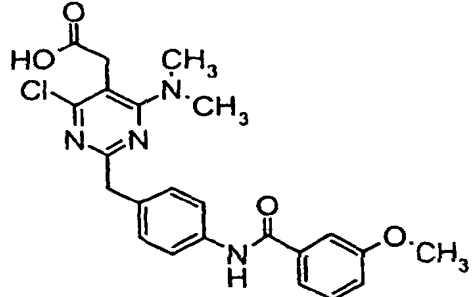
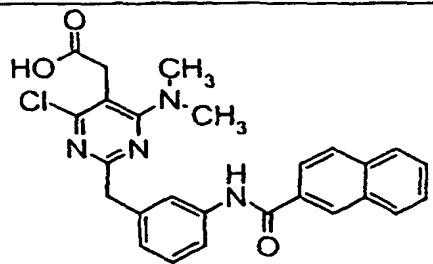
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|--------------------|---|--------|---------------|--------|------------|-------------------|
| 1-26 |  | 575,07 | 574 | 575 | 146 Z | A |
| 1-27 |  | 561,05 | 560,00 | 561,00 | 101 | A |
| 1-28 |  | 590,13 | 589 | 590 | >110 Z | A |
| 1-29 |  | 594,07 | 593 | 594 | >120 Z | C |

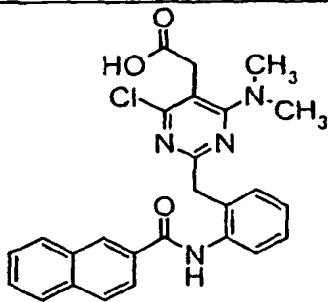
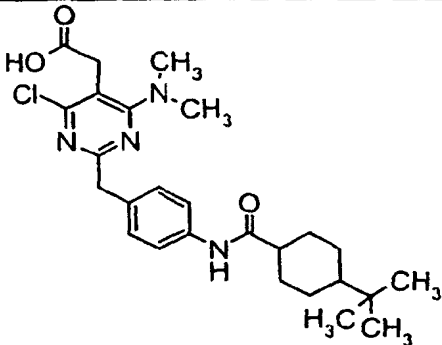
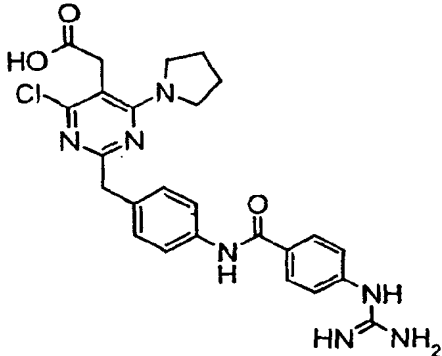
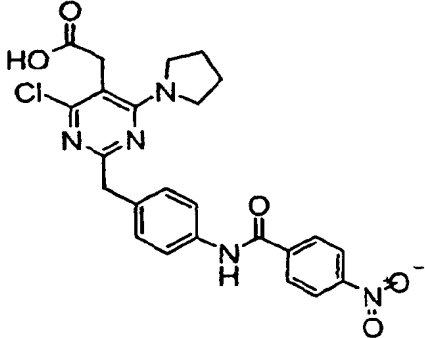
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-30 |  | 642,16 | 641 | 642 | >118 Z | A |
| 1-31 |  | 642,16 | 641 | 642 | >123 Z | B |
| 1-32 |  | 475,94 | 475 | 476 | 135-142 | A |
| 1-33 |  | 450,93 | 450 | 451 | >160 Z | A |

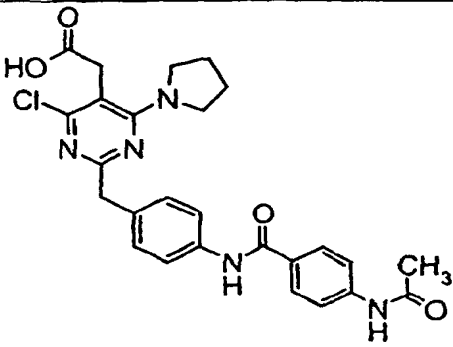
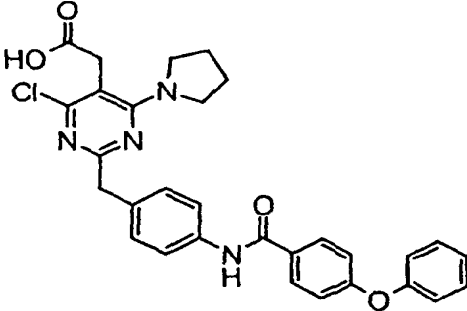
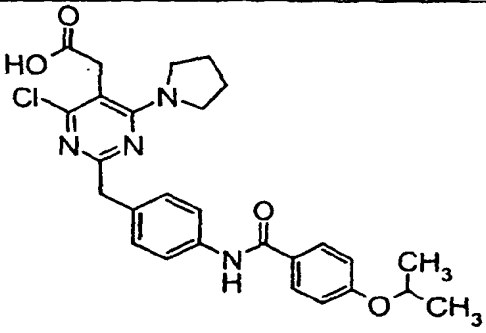
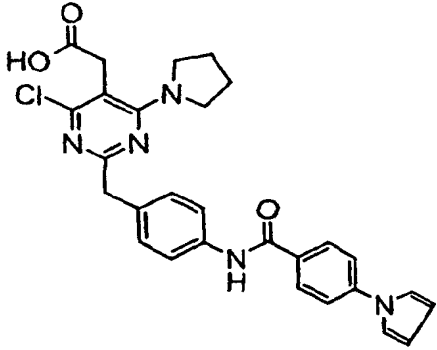
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-34 |  | 493,78 | 492 | 493 | >168 Z | A |
| 1-35 |  | 459,34 | 458 | 459 | >166 Z | A |
| 1-36 |  | 454,92 | 454 | 455 | >130 Z | A |
| 1-37 |  | 467,96 | 467 | 468 | >111 Z | A |

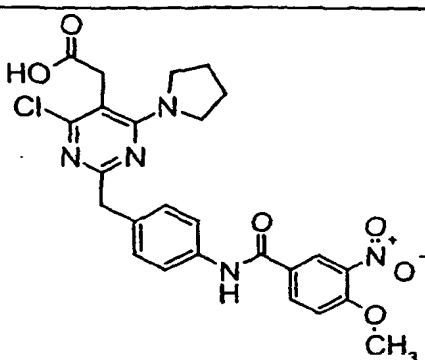
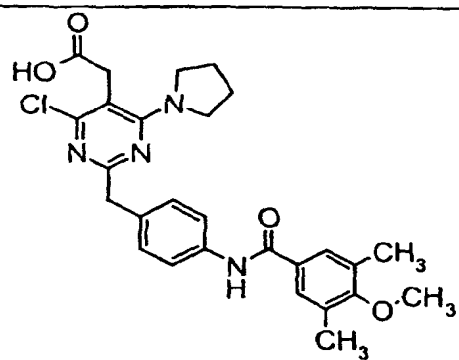
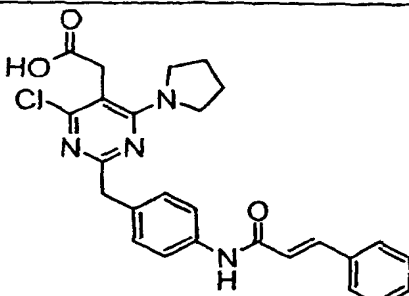
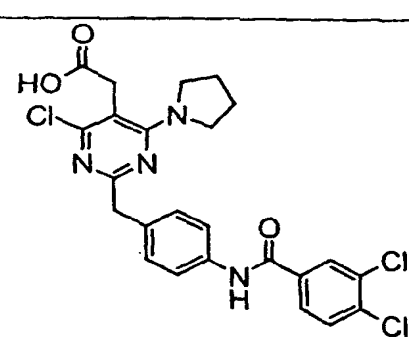
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-38 |  | 484,94 | 484 | 485 | >95 Z | B |
| 1-39 |  | 492,89 | 492 | 493 | >150 Z | A |
| 1-40 |  | 503,97 | 503 | 504 | oil | C |
| 1-41 |  | 485,37 | 484 | 485 | 117 Z | A |

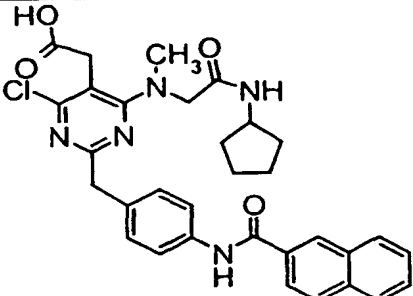
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|--------------------|---|--------|---------------|--------|------------|-------------------|
| 1-42 |  | 503,79 | 503 | 504 | 100 Z | A |
| 1-43 |  | 493,78 | 492,00 | 493,00 | 101 Z | C |
| 1-44 |  | 493,78 | 492 | 493 | 96 Z | A |
| 1-45 |  | 460,87 | 460 | 461 | >94 Z | A |

| ex-ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|-------------|---|--------|------------|-----|---------|----------------|
| 1-46 |  | 493,78 | 492 | 493 | >99 Z | A |
| 1-47 |  | 459,34 | 458 | 459 | >108 Z | A |
| 1-48 |  | 454,92 | 454 | 455 | >75 | A |
| 1-49 |  | 474,95 | 474 | 475 | 186 | B |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-50 |  | 474,95 | 474 | 475 | 295 Z | D |
| 1-51 |  | 487,05 | 486 | 487 | 104 Z | A |
| 1-52 |  | 507,98 | 507 | 508 | 176 | D |
| 1-53 |  | 495,93 | 495 | 496 | 134 Z | B |

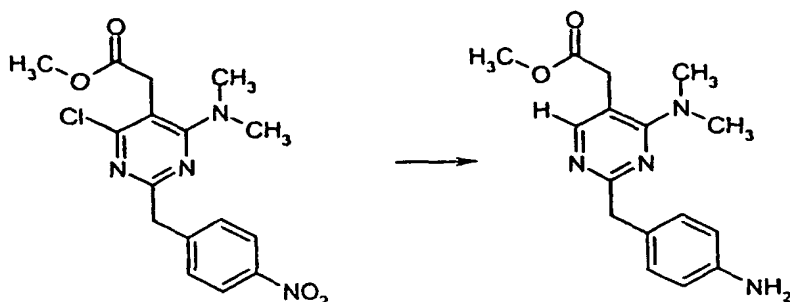
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|------------|------------|-------------------|
| 1-54 |  | 507,98 | 507,00 | 508,0 0 | 189 Z | B |
| 1-55 |  | 543,03 | 542 | 543 | 160 | A |
| 1-56 |  | 509,01 | 508 | 509 | 156 Z | A |
| 1-57 |  | 516,00 | 515 | 516 | 217 Z | A |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-58 |  | 525,95 | 525 | 526 | 118 | A |
| 1-59 |  | 509,01 | 508 | 509 | 115 Z | A |
| 1-60 |  | 476,97 | 476 | 477 | 120 Z | A |
| 1-61 |  | 519,82 | 518 | 519 | 129 Z | A |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|------------|-------------------|
| 1-62 |  | 586,10 | 585 | 586 | >176 Z | A |

Methyl [2-(4-aminobenzyl)-4-(dimethylamino)-5-pyrimidinyl]acetate

[0149]

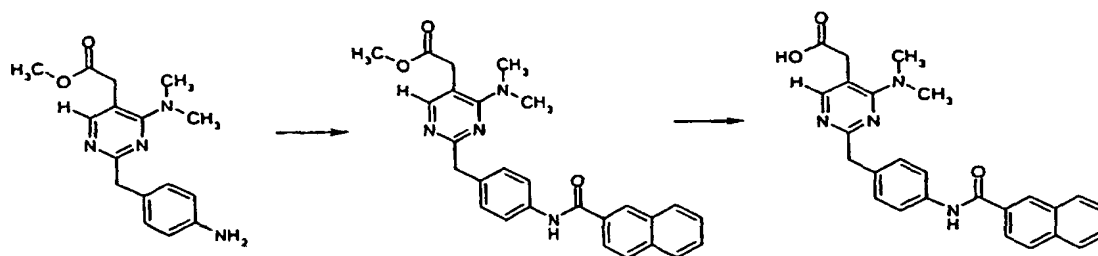


[0150] A suspension of methyl [4-chloro-6-(dimethylamino)-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (3.00 g, 8.22 mmol) and potassium acetate (2.42 g, 24.7 mmol) in methanol (30 mL) was treated with 10% Pd/C (1.00 g). The resulting black suspension was stirred under an atmosphere of hydrogen for 15 h and then filtered over Celite. The residue was rinsed with methanol and the filtrate concentrated to dryness before partitioning between EtOAc and water. The separated organic layer was sequentially washed with saturated NaHCO₃ and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. Chromatographic purification (silica gel, 1% MeOH in CHCl₃) of the thus obtained crude product then yielded methyl [2-(4-aminobenzyl)-4-(dimethylamino)-5-pyrimidinyl]acetate (2.40 g, 97% yield) as a brown oil.

Example 2-1

{4-(Dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid

[0151]



[0152] A solution containing methyl [2-(4-aminobenzyl)-4-(dimethylamino)-5-pyrimidinyl]acetate (0.090 g, 0.30 mmol) and PyBOP (0.187 g, 0.36 mmol) in anhydrous DMF (1 mL) at r.t. was treated with 2-naphthoic acid (0.062 g, 0.36 mmol). The reaction mixture was stirred for 3 h before diluting with water. The thus quenched reaction mixture was extracted with EtOAc and the combined organic extracts was washed sequentially with 0.5N HCl, saturated NaHCO₃, and brine, dried over anhydrous MgSO₄, filtered, and concentrated to dryness to give the crude product methyl {4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetate.

[0153] The thus obtained methyl {4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate was dissolved in THF (6 mL) and treated with 1N NaOH (3 mL). The biphasic reaction mixture was stirred at r.t. for 14 h and then Et₂O was added. The organic layer was siphoned off and the remaining aqueous layer was neutralized with 6N HCl. The separated solids was collected by suction, triturated with diisopropyl ether, and filtered to give {4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetic acid (0.047 g, 36% yield).

[0154] ¹H NMR (500 MHz, DMSO-*d*₆) δ: 3.04 (s, 6H), 3.65 (s, 2H), 3.93 (s, 2H), 7.32 (d, J=9 Hz, 2H), 7.60-7.66 (m, 2H), 7.73 (d, J=9 Hz, 2H), 7.97 (s, 1H), 8.00-8.09 (m, 4H), 10.35 (s, 1H), 12.54 (s, 1H).

Molecular weight: 440.51

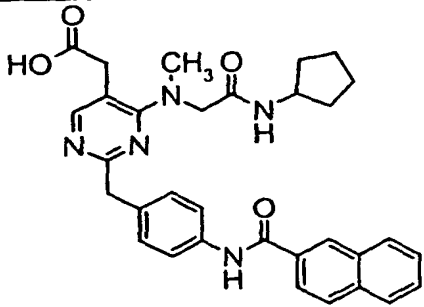
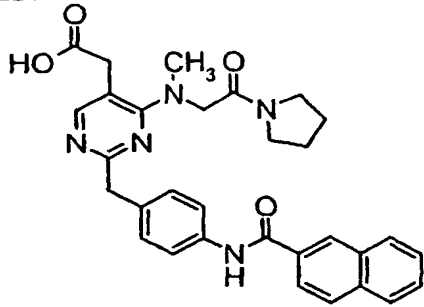
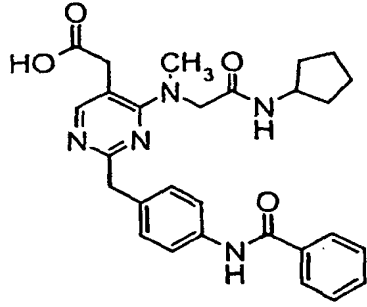
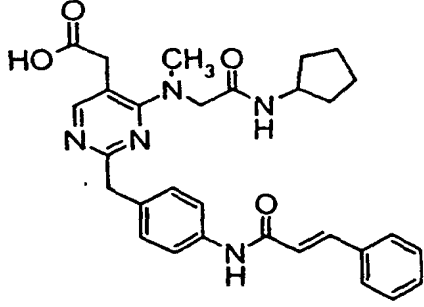
Mass spectrometry: 441

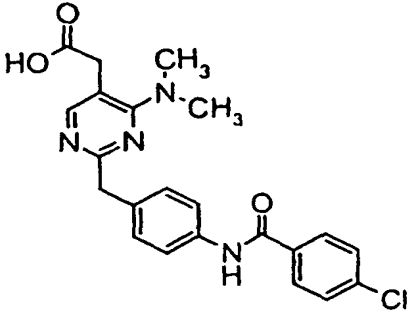
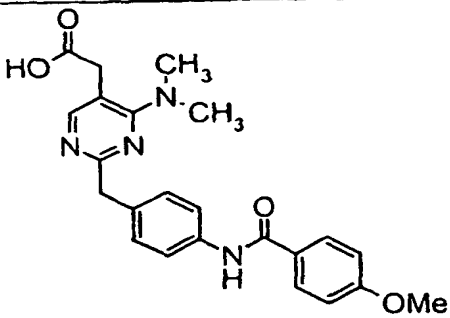
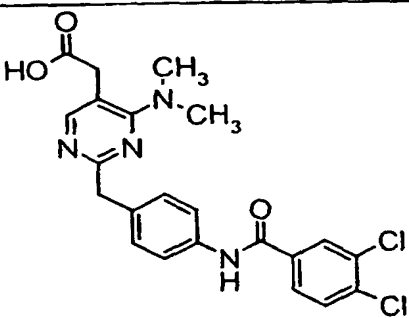
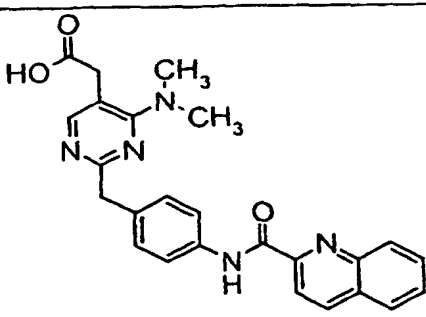
Melting point: 210 °C

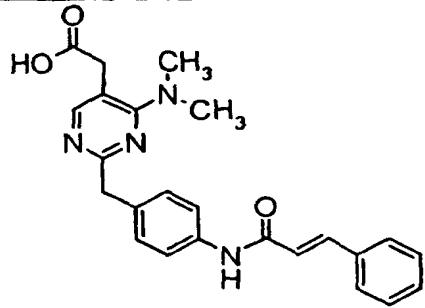
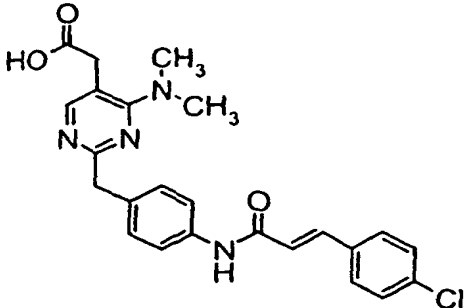
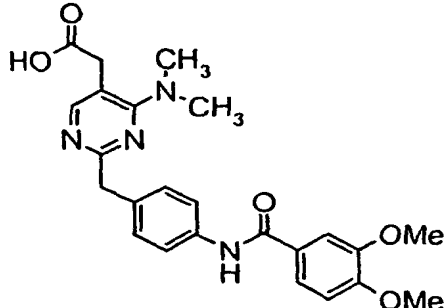
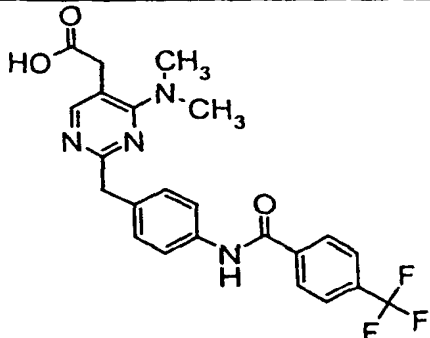
Activity class: A

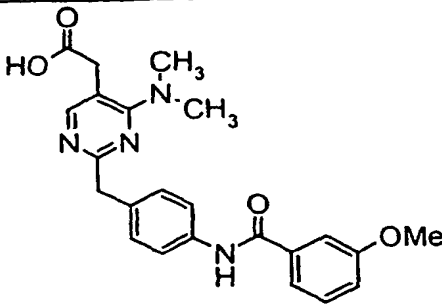
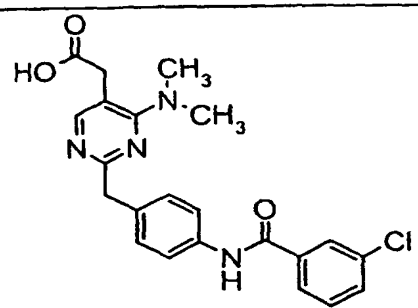
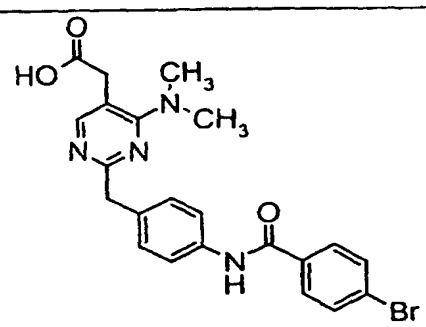
[0155] In a similar manner as described in Example 2-1, compounds in Example 2-2 to 2-16 as shown in Table 2 were synthesized.

Table 2

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|--------|---------|-------------------|
| 2-2 |  | 551,64 | 551 | 552 | 287 Z | A |
| 2-3 |  | 537,62 | 537 | 538 | 201 Z | A |
| 2-4 |  | 501,59 | 501,00 | 502,00 | 212 Z | B |
| 2-5 |  | 527,63 | 527,00 | 528,00 | 209 Z | A |

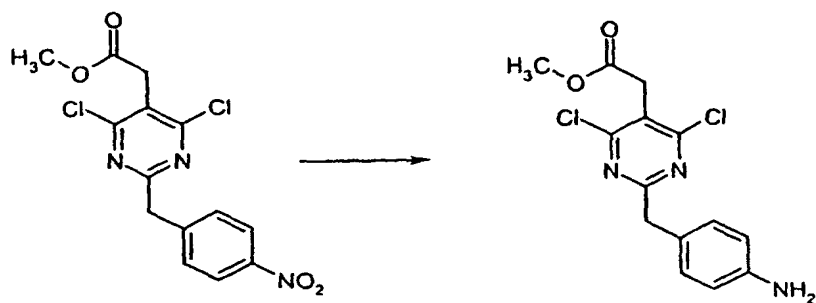
| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|--------|---------|-------------------|
| 2-6 |  | 424,89 | 524,00 | 525,00 | 147 | A |
| 2-7 |  | 420,47 | 420,00 | 421,00 | 111 | A |
| 2-8 |  | 459,34 | 458,00 | 459,00 | 140 | A |
| 2-9 |  | 441,49 | 441,00 | 442,00 | 136-144 | B |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|--------|---------|-------------------|
| 2-10 |  | 416,48 | 416,00 | 417,00 | 135-140 | A |
| 2-11 |  | 450,93 | 450 | 451 | 136-140 | A |
| 2-12 |  | 450,50 | 450,00 | 451,00 | 106-110 | C |
| 2-13 |  | 458,44 | 458 | 459 | 149-153 | A |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|--|--------|---------------|--------|---------|-------------------|
| 2-14 |  | 420,47 | 420,00 | 421,00 | 94 Z | B |
| 2-15 |  | 424,89 | 424,00 | 425,00 | 111-113 | B |
| 2-16 |  | 469,34 | 469 | 470 | 220 Z | A |

Methyl [2-(4-aminobenzyl)-4,6-dichloro-5-pyrimidinyl]acetate

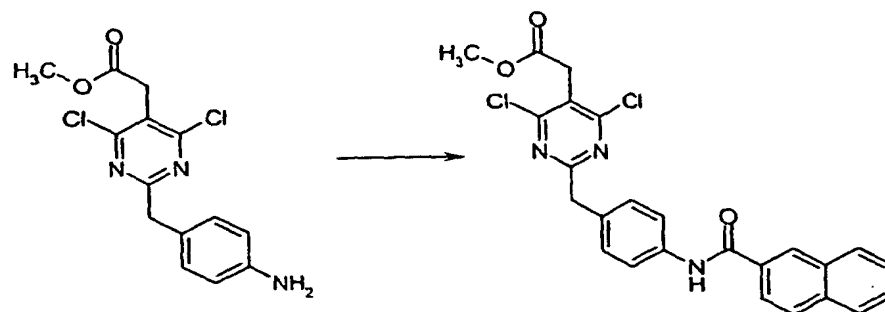
[0156]



[0157] A solution of methyl [4,6-dichloro-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (2.00 g, 5.62 mmol) in anhydrous THF (50 mL) was treated with Pd/C (10% Pd, 0.200 g) and the resulting black suspension was stirred under an atmosphere of hydrogen at r.t. After 16 h, the reaction mixture was filtered over Celite and the residue rinsed with copious amounts of MeOH. The filtrate was concentrated *in vacuo* to give the crude product as a dark yellow oil which was chromatographed (silica gel, 40% EtOAc in *n*-hexane) to give methyl [2-(4-aminobenzyl)-4,6-dichloro-5-pyrimidinyl]acetate (1.32 g, 72% yield) as a white powder.

Methyl {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetate

[0158]

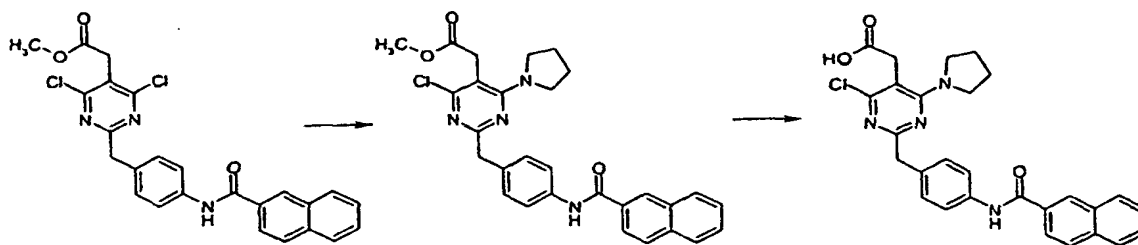


[0159] A mixture of methyl [2-(4-aminobenzyl)-4,6-dichloro-5-pyrimidinyl]acetate (0.073g, 0.23 mmol), 2-naphthoic acid (0.048 g, 0.028 mmol), and WSCI (0.049 g, 0.026 mmol) in anhydrous THF (3 mL) was stirred at r.t. under Ar atmosphere for 10 h. EtOAc (80 mL) was then introduced and the organic phase was washed sequentially with saturated NaHCO₃, water, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained as a light orange oil was triturated with diisopropyl ether and the separated solids was collected by suction to give methyl {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetate (0.090 g, 78% yield) as a white powder.

Example 3-1

[4-Chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid

[0160]



[0161] A mixture of methyl {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetate (0.100 g, 0.21 mmol), pyrrolidine (0.019 mL, 0.23 mmol), and *N,N*-diisopropylethylamine (0.109 mL, 0.62 mmol) in anhydrous DMF (2 mL) was stirred at 80 °C for 5 h. After cooling to r.t., the solvent was evaporated and the remaining residue dissolved in EtOAc. This organic solution was sequentially washed with 1N HCl, water, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. Purification by preparative TLC then afforded methyl [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.100 g, 95% yield) as a white powder.

[0162] A solution of methyl [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.085 g, 0.17 mmol) in THF (3 mL) was treated with 1N NaOH (1.5 mL) and the biphasic mixture was stirred at r.t. for 45 h. Et₂O was then added and the organic layer siphoned off. The remaining aqueous layer was cooled to 0 °C and acidified with 6N HCl. The separated solids were collected by suction and rinsed with water. Drying under high vacuum at 45 °C for

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5 h gave [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid (0.050 g, 56% yield) as an off-white powder.

[0163] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 1.86 (bs, 4H), 3.59 (bs, 4H), 3.78 (s, 2H), 3.88 (s, 2H), 7.32 (d, J=9 Hz, 2H), 7.63 (m, 2H), 7.96-8.13 (m, 4H), 8.57 (s, 1H), 10.39 (s, 1H), 12.72 (s, 1H).

5 Molecular weight: 500.99

Mass spectrometry: 501

Melting point: 196 Z °C

Activity class: A

10 **[0164]** In a similar manner as described in Example 3-1, compounds in Example 3-2 to 3-16 as shown in Table 3 were synthesized.

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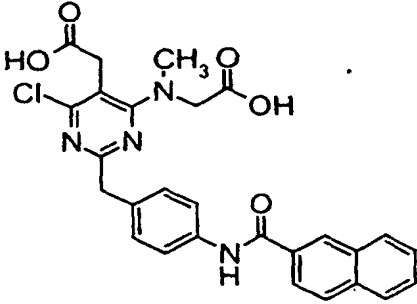
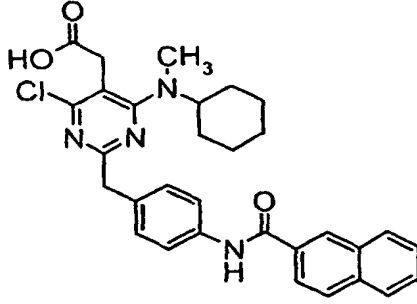
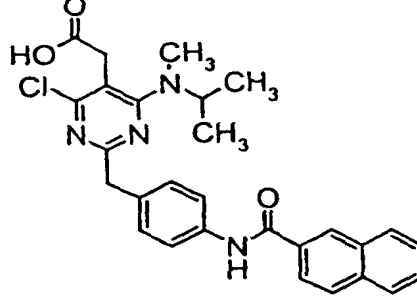
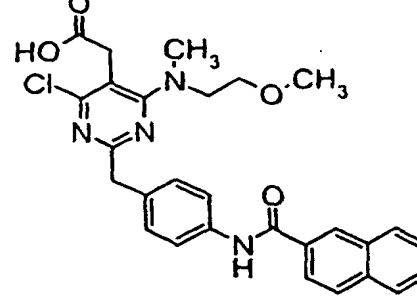
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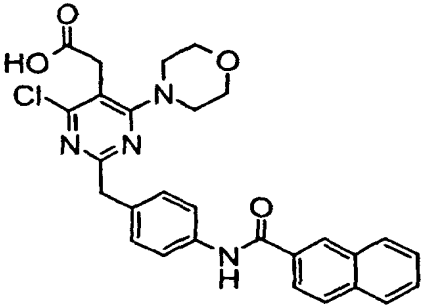
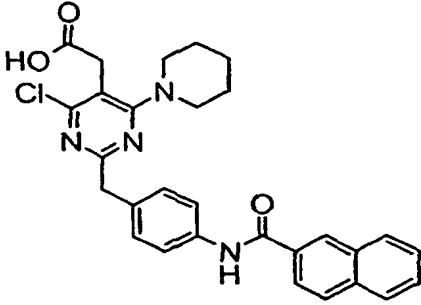
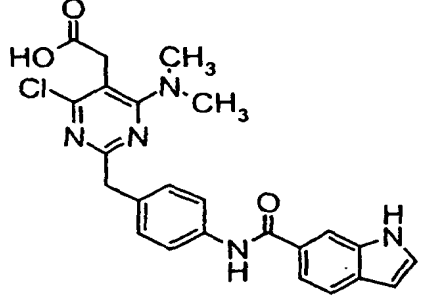
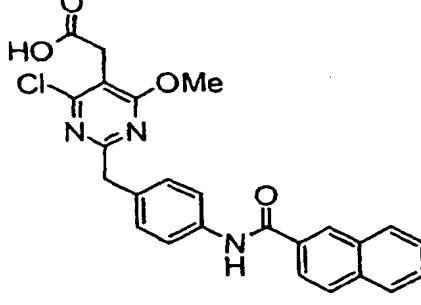
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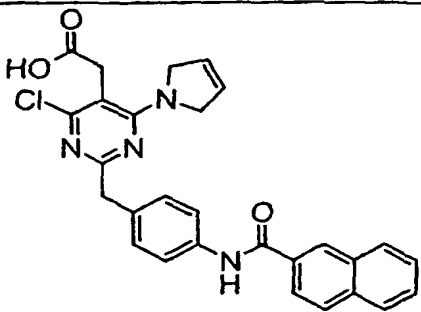
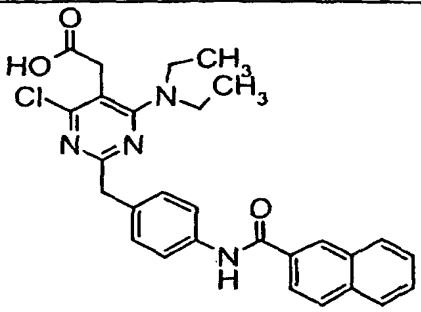
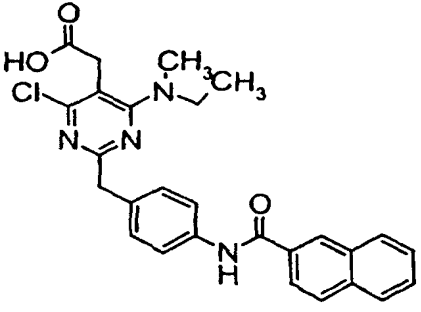
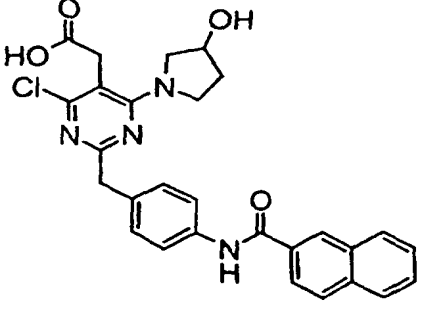
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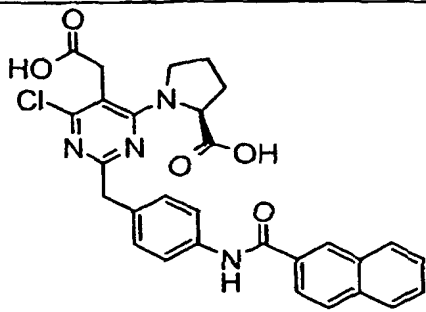
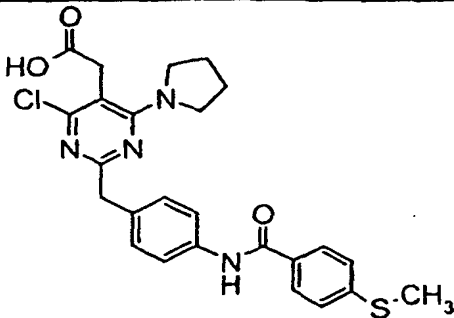
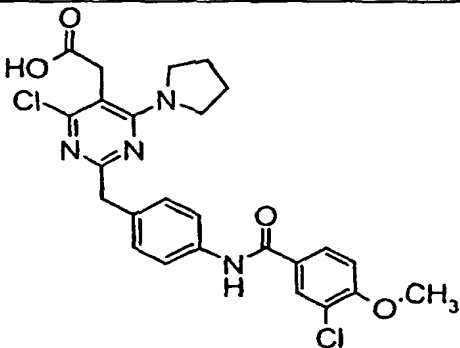
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Table 3

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|---------|-------------------|
| 3-2 |  | 518,96 | 518 | 519 | 176 Z | B |
| 3-3 |  | 543,07 | 542 | 543 | 185 Z | A |
| 3-4 |  | 503,01 | 502 | 503 | 132 Z | A |
| 3-5 |  | 519,00 | 518 | 519 | 144 | A |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|---------|-------------------|
| 3-6 |  | 516,99 | 516 | 517 | 172 Z | A |
| 3-7 |  | 515,02 | 514 | 515 | 157 Z | A |
| 3-8 |  | 463,93 | 463 | 464 | >165 Z | A |
| 3-9 |  | 461,91 | 461 | 462 | 201 Z | A |

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|---------|-------------------|
| 3-10 |  | 498,97 | 498 | 499 | >146 Z | A |
| 3-11 |  | 503,01 | 502 | 503 | >90 Z | B |
| 3-12 |  | 488,98 | 488 | 489 | >125 Z | A |
| 3-13 |  | 516,99 | 516 | 517 | >202 Z | A |

| ex-ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|-------------|---|--------|------------|-----|---------|----------------|
| 3-14 |  | 545,00 | 544 | 545 | >174 Z | B |
| 3-15 |  | 497,02 | 496 | 497 | 157 Z | A |
| 3-16 |  | 515,40 | 514 | 515 | 108 Z | A |

Example 4-1

{2-[4-[(Anilino)carbonyl]amino]benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid

[0165] A solution of methyl [2-(4-aminobenzyl)-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetate (0.050 g, 0.11 mmol) in DMF (2 mL) was treated with phenyl isocyanate (0.022 mL, 0.20 mmol). After stirring at r.t. for 18 h, EtOAc was added and the organic phase was washed with 8% NaHCO₃ and brine, dried over anhydrous Na₂SO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was triturated with CH₂Cl₂ and diisopropyl ether to give methyl {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(3-phenylureido)benzyl]-5-pyrimidinyl}acetate (0.055 g, 87% yield) as a white powder.

[0166] To a solution of methyl {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(3-phenylureido)benzyl]-5-pyrimidinyl}acetate (0.047 g, 0.083 mmol) in THF (3 mL) was added 1N NaOH (1.5 mL) and the biphasic mixture was stirred at r.t. for 18 h. Et₂O was added and the separated organic layer siphoned off. The remaining aqueous layer was acidified with 6N HCl and the separated solids were collected by suction and rinsed with water and diisopropyl

ether. Drying under high vacuum for 5 h gave {2-[4-[(anilincarbonyl)amino]benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid (0.026 g, 56% yield) as a white powder.

[0167] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 1.26-1.82 (m, 8H), 3.08 (s, 3H), 3.69 (s, 2H), 3.81 (s, 2H), 3.98 (s, 2H), 4.00-4.18 (m, 1H), 6.95 (t, J=7 Hz, 1H), 7.20 (d, J=9 Hz, 2H), 7.27 (t, J=8 Hz, 2H), 7.35 (d, J=9 Hz, 2H), 7.43 (d, J=8 Hz, 2H), 7.94 (d, J=7 Hz, 1H), 8.61 (d, J=5 Hz, 2H), 12.76 (bs, 1H).

Molecular weight: 551.05

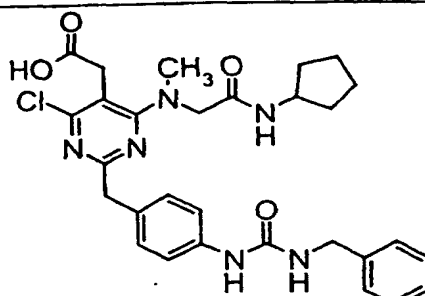
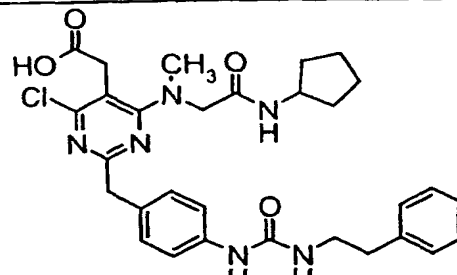
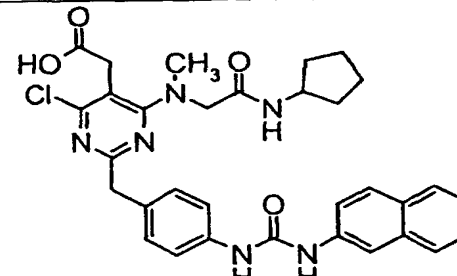
Mass spectrometry: 551

Melting point: >153 Z °C

Activity class: B

[0168] In a similar manner as described in Example 4-1, compounds in Example 4-2 to 4-4 as shown in Table 4 were synthesized.

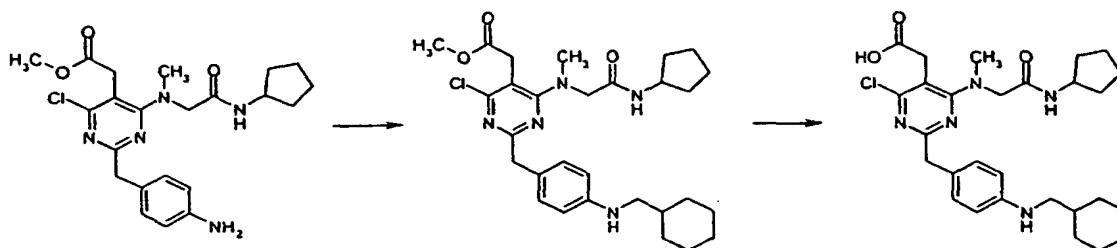
Table 4

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|---------|-------------------|
| 4-2 |  | 565,08 | 564 | 565 | >134 Z | B |
| 4-3 |  | 579,10 | 578 | 579 | >146 Z | B |
| 4-4 |  | 601,11 | 600 | 601 | >165 Z | B |

Example 5-1

[4-Chloro-2-{4-[(cyclohexylmethyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid

[0169]



[0170] A mixture of methyl [2-(4-aminobenzyl)-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetate (0.150 g, 0.336 mmol), cyclohexane-carbaldehyde (0.042 g, 0.370 mmol), acetic acid (0.019 mL, 0.336 mmol) and sodium triacetoxyborohydride (0.107 g, 0.505 mmol) in 1,2 dichloroethane (3 mL) was stirred overnight at r.t. Water was then added and the mixture was neutralized with 1N NaOH followed by extraction with dichloromethane. The combined organic extracts were washed sequentially with water and brine, dried over anhydrous MgSO_4 , filtered, and concentrated *in vacuo*. The crude product thus obtained was chromatographed by preparative TLC to give methyl [4-chloro-2-{4-[(cyclohexylmethyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetate (0.092 g, 51% yield) as an amorphous solid.

[0171] A solution of methyl [4-chloro-2-{4-[(cyclohexylmethyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetate (0.083 g, 0.15 mmol) in THF (5 mL) was treated with 1N NaOH (2.5 mL) and the resulting mixture was stirred at r.t. for 13 h. Subsequent to neutralization with 6N HCl, the quenched reaction mixture was evaporated to dryness and the remaining residue dissolved with EtOH. The insoluble inorganic salts were removed by filtration and the filtrate was concentrated *in vacuo*. The crude product thus obtained was purified with preparative TLC eluting with 15% EtOH in CH_2Cl_2 to give [4-chloro-2-{4-[(cyclohexylmethyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid (0.023 g, 28% yield) as a clear oil.

[0172] ^1H NMR (300 MHz, CDCl_3) δ : 0.85-1.32 (m, 4H), 1.48-1.95 (m, 15H), 2.80-3.05 (m, 7H), 3.73 (s, 2H), 3.89 (s, 2H), 4.01 (s, 2H), 6.51 (d, $J=9$ Hz, 2H), 6.69 (d, $J=7$ Hz, 1H), 7.13 (d, $J=7$ Hz, 2H)

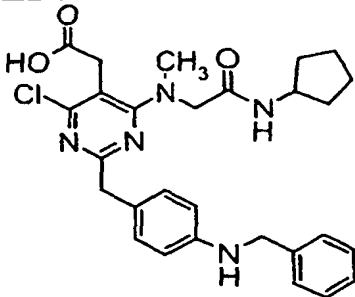
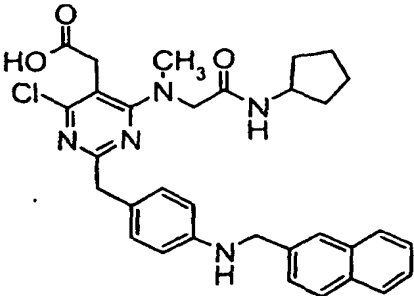
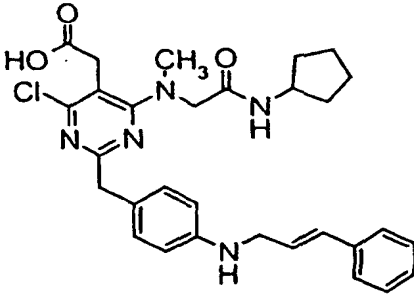
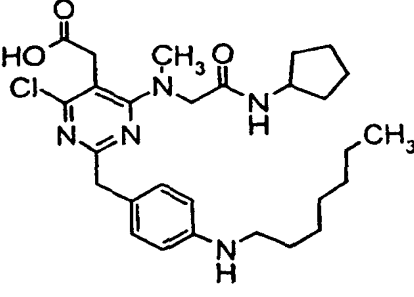
Molecular weight: 528.10

Mass spectrometry: 528

Activity class: D

[0173] In a similar manner as described in Example 5-1, compounds in Example 5-2 to 5-5 as shown in Table 5 were synthesized.

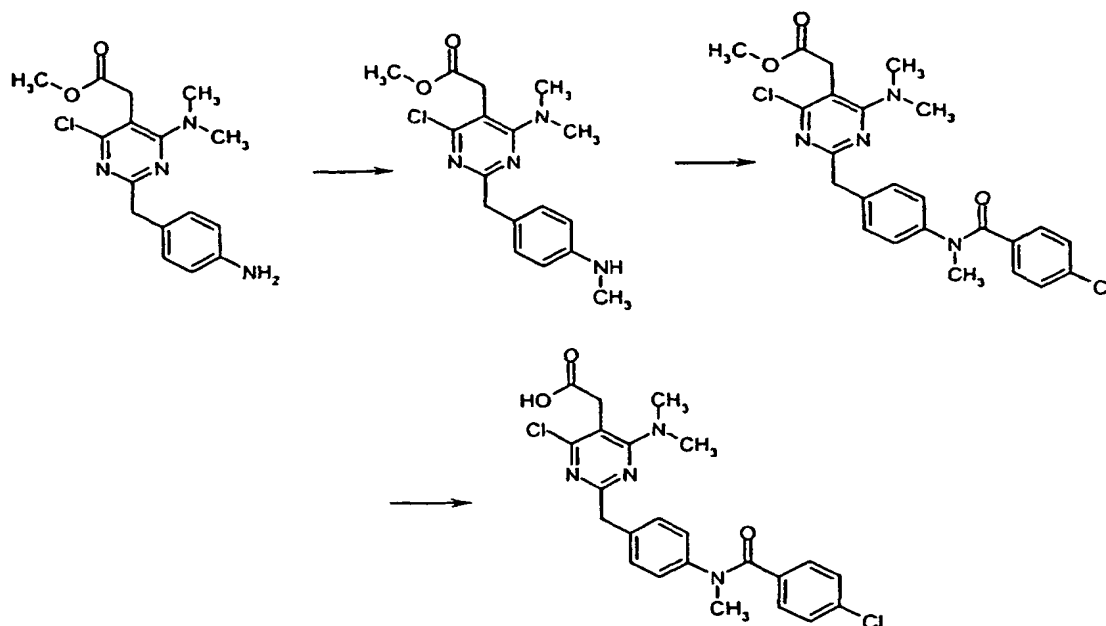
Table 5

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|---|--------|---------------|-----|---------|-------------------|
| 5-2 |  | 522,05 | 521 | 522 | >70 | D |
| 5-3 |  | 572,11 | 571 | 572 | >96 | C |
| 5-4 |  | 548,09 | 547 | 548 | oil | C |
| 5-5 |  | 530,12 | 529 | 530 | oil | D |

Example 6-1

[4-Chloro-2-{4-[(4-chlorobenzoyl)(methyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid

[0174]



[0175] To acetic anhydride (0.48 mL, 5.13 mmol) at 0 °C under Ar atmosphere was added formic acid (0.24 mL, 6.31 mmol) dropwise followed by heating of the mixture at 60 °C for 2 h. After cooling to r.t., THF (1 mL) was added followed by a solution of methyl [2-(4-aminobenzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetate (0.660 g, 1.97 mmol) in THF (1 mL). This was then stirred for 3 h and concentrated to dryness. The remaining residue was dissolved in THF and cooled to 0 °C followed by the dropwise addition of borane dimethyl sulfide complex until the vigorous effervescence ceased. The mixture was gently refluxed for 14 h and then cooled to 0 °C. Methanol was added and the mixture was stirred at r.t. for 1 h followed by the addition of concentrated HCl to pH ~5 and stirring was continued for another 30 min. The solvent was evaporated *in vacuo*, the remaining residue basified with water and 1N NaOH, and the aqueous layer was extracted with Et₂O. The combined organic extracts were dried over anhydrous Na₂SO₄, filtered, and concentrated to dryness to give the crude product which was chromatographed on silica gel eluting with 5% acetone in CH₂Cl₂ to give methyl [4-chloro-6-(dimethylamino)-2-[4-(methylamino)benzyl]-5-pyrimidinyl]acetate (0.260 g, 38% yield) as a pale yellow oil.

A solution of methyl [4-chloro-6-(dimethylamino)-2-[4-(methylamino)benzyl]-5-pyrimidinyl]acetate (0.080 g, 0.23 mmol), 1-hydroxybenzotriazole (0.043 g, 0.32 mmol), triethylamine (0.11 mL, 0.80 mmol), and 4-chlorobenzoic acid (0.043 g, 0.28 mmol) was treated with WSCI (0.066 g, 0.34 mmol) at r.t. and the reaction mixture was stirred at r.t. for 16 h. EtOAc was then added and the organic layer was washed sequentially with 0.5N HCl, saturated NaHCO₃, and brine, dried over anhydrous Na₂SO₄, filtered, and concentrated to dryness to give the crude product methyl [4-chloro-2-{4-[(4-chlorobenzoyl)(methyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetate.

[0176] This crude methyl [4-chloro-2-{4-[(4-chlorobenzoyl)(methyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetate was dissolved in THF (3 mL) and treated with 1N NaOH (2 mL) and stirred at r.t. for 24 h. Et₂O was added and the organic phase was siphoned off. The remaining aqueous layer was acidified with 6N HCl to pH ~5 and the separated solids were collected by suction and rinsed with water and diisopropyl ether. Drying under high vacuum at r.t. for 4 h then gave [4-chloro-2-{4-[(4-chlorobenzoyl)(methyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid (0.029 g, 27% yield) as a pale yellow powder.

[0177] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 2.50 (s, 3H), 2.98 (s, 6H), 3.65 (s, 2H), 3.88 (s, 2H), 7.10 (d, J=9 Hz, 2H), 7.20 (d, J=9 Hz, 2H), 7.20-7.27 (bs, 4H), 12.77 (bs, 1H).

Molecular weight: 473.36

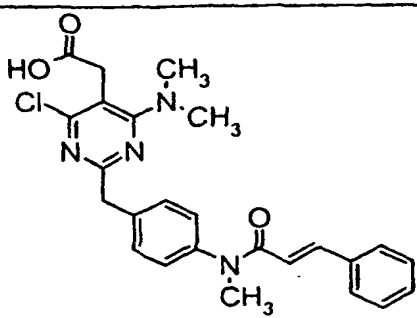
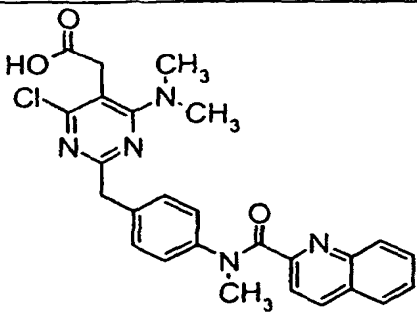
Mass spectrometry: 473

Melting point: >68 °C

Activity class: C

[0178] In a similar manner as described in Example 6-1, compounds in Example 6-2 to 6-3 as shown in Table 6 were synthesized.

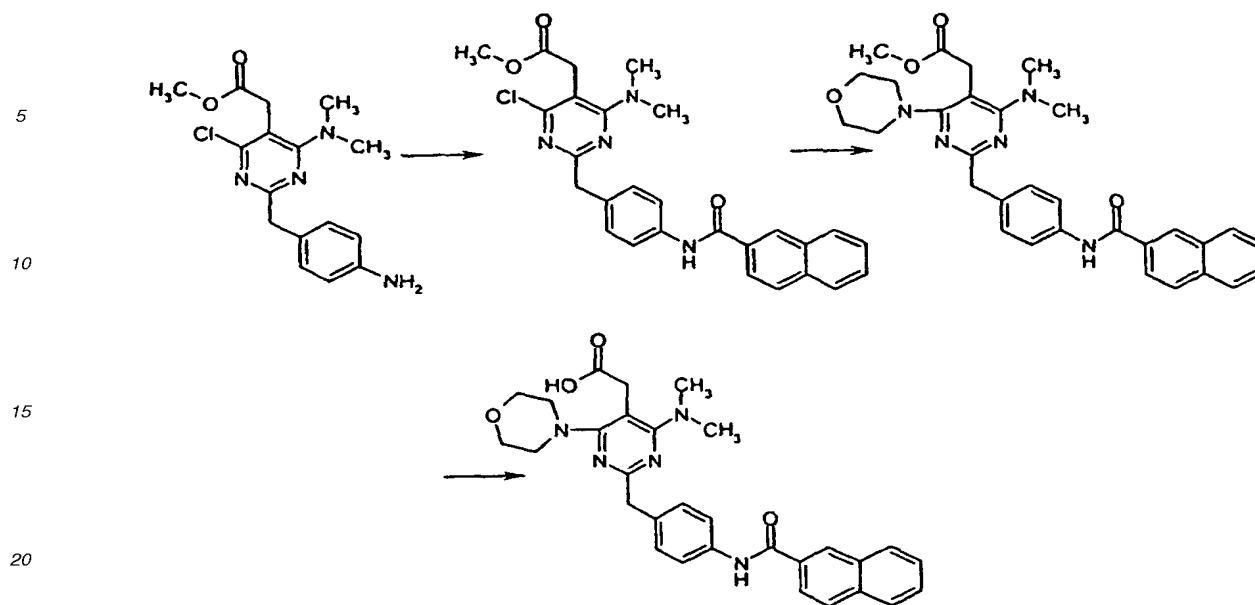
Table 6

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|--|--------|---------------|-----|---------|-------------------|
| 6-2 |  | 464,96 | 464 | 465 | 80 Z | D |
| 6-3 |  | 489,97 | 489 | 490 | >78 Z | D |

Example 7-1

{4-(Dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid

[0179]



[0180] To a mixture of methyl [2-(4-aminobenzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetate (0.090 g, 0.30 mmol) and PyBOP (0.187 g, 0.36 mmol) in anhydrous DMF (1 mL) at r.t. was added 2-naphthoic acid (0.062 g, 0.36 mmol). The resulting reaction mixture was stirred at r.t. for 3 h at which time water was added and the resulting aqueous phase was extracted with EtOAc. The combined organic extracts were sequentially washed with 0.5N HCl, saturated NaHCO₃, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo* to give methyl {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate as a colorless oil.

[0181] A mixture of methyl {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate (0.094 g, 0.19 mmol) and morpholine (0.048 mL, 0.55 mmol) in DMPU (2 mL) was heated at 150 °C in a sealed tube for 15 h. After cooling to r.t., the reaction mixture was poured into water and extracted with EtOAc. The combined organic extracts were washed sequentially with 1N HCl, saturated NaHCO₃, and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was chromatographed over silica gel eluting with 5% EtOAc in CH₂Cl₂ to give methyl {4-(dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate (0.096 g, 95% yield) as an oil.

[0182] A solution of methyl {4-(dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl} acetate (0.096 g, 0.18 mmol) in MeOH (2 mL) at r.t. was treated with 1N NaOH (1 mL) and the resulting mixture was heated at 60 °C for 5 h. After cooling to r.t., the volatiles were removed under reduced pressure and the remaining aqueous layer was washed with Et₂O and acidified with 1N HCl. The separated solids were collected by suction, rinsed with water, and dried under vacuum to give {4-(dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid (0.059 g, 64% yield) as a white solid.

[0183] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 2.90 (s, 6H), 3.17 (m, 4H), 3.43 (s, 2H), 3.65 (m, 4H), 3.86 (s, 2H), 7.34 (d, J=9 Hz, 2H), 7.59-7.68 (m, 2H), 7.72 (d, J=9 Hz, 2H), 7.99-8.10 (m, 4H), 8.56 (s, 1H), 10.37 (s, 1H), 12.20 (bs, 1H)

Molecular weight: 525.61

Mass spectrometry: 526

Melting point: 218 Z °C

Activity class: B

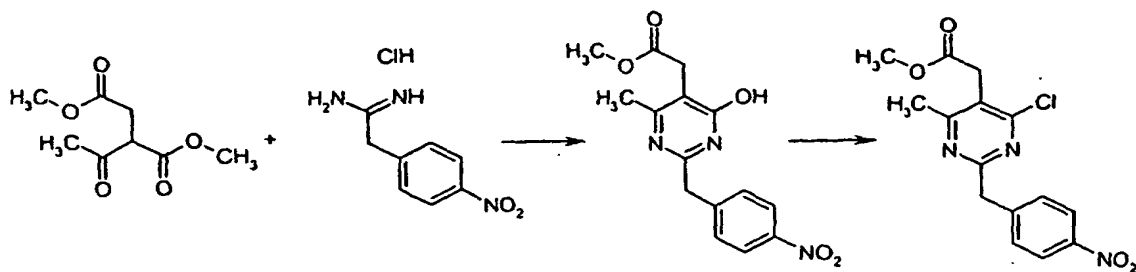
[0184] In a similar manner as described in Example 6-1, compounds in Example 7-2 to 7-4 as shown in Table 6 were synthesized.

Table 7

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|-----------|--------|---------------|-----|------------|-------------------|
| 7-2 | | 483,58 | 483 | 484 | 200 Z | B |
| 7-3 | | 509,61 | 509 | 510 | 154 Z | B |
| 7-4 | | 523,64 | 523 | 524 | 149 Z | B |

Methyl [4-chloro-6-methyl-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate

[0185]



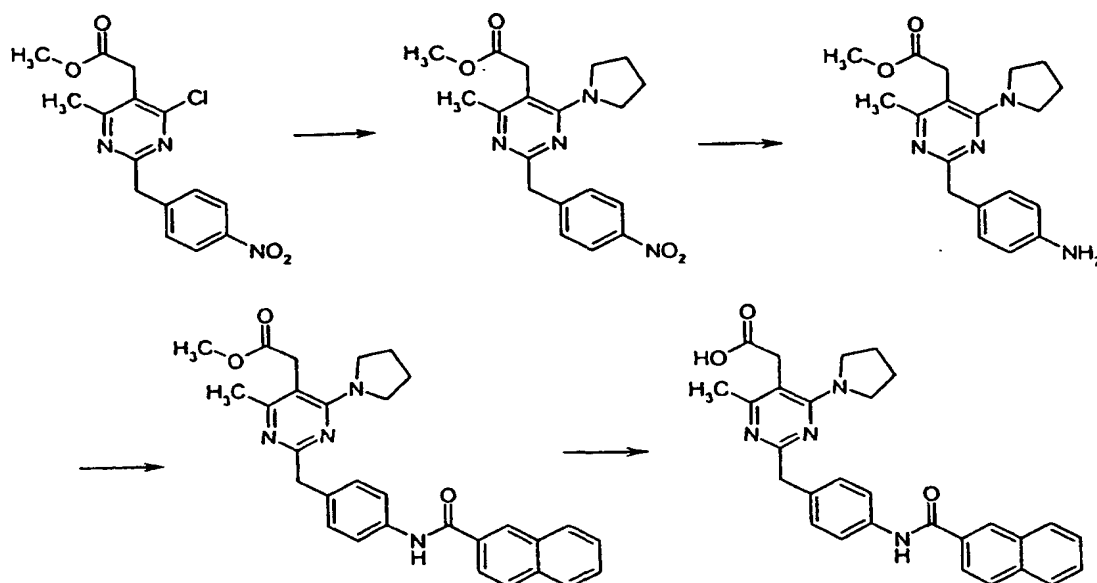
[0186] A mixture of 2-(4-nitrophenyl)ethanimidamide hydrochloride (0.22 g, 1.0 mmol), dimethyl acetylsuccinate (0.19 g, 1.0 mmol), and sodium methoxide (0.07 g, 1.3 mmol) in MeOH (10 mL) was refluxed for 15 h. After cooling to r.t., the separated solids were collected by suction and added to a pre-formed solution of thionyl chloride (0.65 mL, 8.9 mmol) in MeOH (7.5 mL). The resulting mixture was refluxed for 16 h and then cooled to r.t. Acetone was added and the precipitated solids were collected by suction, rinsed with acetone and dried under high vacuum for 4 h to give methyl [4-hydroxy-6-methyl-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (0.12 g, 38% yield) as a white solid.

[0187] A solution of methyl [4-hydroxy-6-methyl-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (1.59 g, 5.0 mmol) and *N,N*-dimethylaniline (0.56 mL, 4.4 mmol) in POCl₃ (2.33 mL, 25 mmol) was refluxed for 14 h. After cooling to r.t., the reaction mixture was poured into ice-cold saturated K₂CO₃. The resulting aqueous layer was extracted with EtOAc and the combined organic extracts was washed with brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was chromatographed over silica gel eluting with 20% EtOAc in *n*-hexane to afford methyl [4-chloro-6-methyl-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (0.54 g, 32% yield) as a white powder.

Example 8-1

[4-Methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid

[0188]



[0189] A solution of methyl [4-chloro-6-methyl-2-(4-nitrobenzyl)-5-pyrimidinyl]acetate (0.45 g, 1.3 mmol) and pyrrolidine (0.13 mL, 1.6 mmol) in DMF (10 mL) at r.t. was treated with triethylamine (0.22 mL, 1.6 mmol) and the resulting mixture was stirred at 85 °C for 13 h. After cooling to r.t., the reaction mixture was poured into water and extracted with EtOAc. The combined organic extracts was washed with saturated NaHCO₃ and brine, dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The crude product thus obtained was chromatographed over silica gel eluting with 50% EtOAc in CH₂Cl₂ to give methyl [4-methyl-2-(4-nitrobenzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.40 g, 80% yield) as a white powder.

[0190] To a solution of methyl [4-methyl-2-(4-nitrobenzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.074 g, 0.20 mmol) in anhydrous THF (2 mL) was added Pd/C (10% Pd, 0.050 g) and the resulting black suspension was stirred under an atmosphere of hydrogen. After 1 h, the reaction mixture was filtered through Celite and the filtrate was concentrated *in vacuo* to give methyl [2-(4-aminobenzyl)-4-methyl-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate.

[0191] A solution of methyl [2-(4-aminobenzyl)-4-methyl-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.034 g, 0.10 mmol) in THF (1 mL) at r.t. was treated with PyBOP (0.052 g, 0.10 mmol), 2-naphthoic acid (0.019 g, 0.11 mmol), and *N,N*-diisopropylethylamine (0.417 mL, 0.10 mmol). After stirring at r.t. for 17 h, the reaction mixture was poured into water and extracted with EtOAc. The combined organic extracts was dried over anhydrous MgSO₄, filtered, and concentrated *in vacuo*. The remaining residue was chromatographed over silica gel eluting with 60% EtOAc in CH₂Cl₂ to give methyl [4-methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.018 g, 36% yield) as a yellow oil.

[0192] A solution of methyl [4-methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetate (0.018 g, 0.04 mmol) in THF (1 mL) at r.t. was treated with 1N NaOH (0.5 mL) and the resulting biphasic mixture was stirred at 60 °C for 13 h. After cooling to r.t., Et₂O was added and the organic layer siphoned off. The remaining aqueous layer was acidified with 6N HCl and the separated solids were collected by suction, rinsed with water, and dried under high vacuum for 4 h to give [4-methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid (0.006 g, 37% yield) as a white solid.

[0193] ¹H NMR (300 MHz, DMSO-*d*₆) δ: 1.86 (bs, 4H), 2.29 (s, 3H), 3.60 (bs, 4H), 3.71 (s, 2H), 3.94 (s, 2H), 7.35 (d, J=8 Hz, 2H), 7.60-7.67 (m, 2H), 7.75 (d, J=8 Hz, 2H), 8.00-8.10 (m, 4H), 8.56 (s, 1H), 10.40 (s, 1H), 12.73 (bs, 1H)

Molecular weight: 480.57

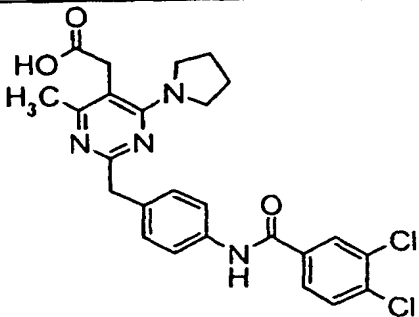
Mass spectrometry: 481

Melting point: 184 Z °C

Activity class: A

[0194] In a similar manner as described in Example 8-1, compound in Example 8-2 as shown in Table 8 was synthesized.

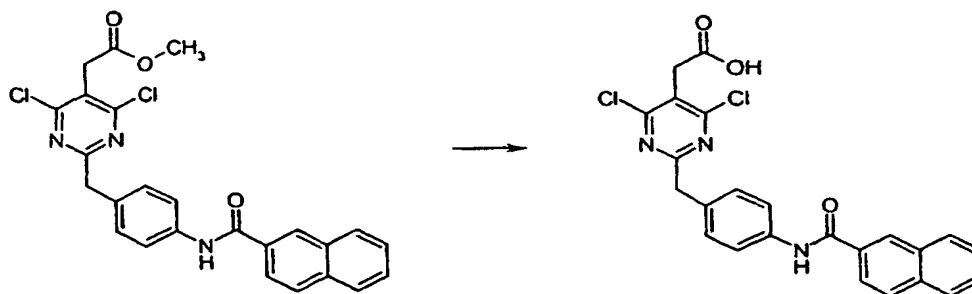
Table 8

| ex- ample No | Structure | MW | Exact Mass | MS | mp (°C) | Activity class |
|--------------------|--|--------|---------------|-----|------------|-------------------|
| 8-2 |  | 499,40 | 498 | 499 | 196 Z | A |

Example 9-1

{4,6-Dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid

[0195]



[0196] A THF (1.5 mL) solution of methyl {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetate (0.048 g, 0.10 mmol) at r.t. was treated with 1N NaOH (1 mL). After stirring for 16 h at r.t., the reaction mixture was poured into

water and washed with EtOAc. The aqueous layer was acidified with 1N HCl and back extracted with EtOAc. The combined organic extracts was washed with brine, dried over anhydrous MgSO_4 , filtered, and concentrated *in vacuo*. The remaining residue was chromatographed over silica gel eluting with 10% THF in CH_2Cl_2 containing 0.5% AcOH to give {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid (0.007 g, 15% yield) as a white solid.

[0197] ^1H NMR (300 MHz, $\text{DMSO}-d_6$) δ : 3.87 (s, 2H), 4.19 (s, 2H), 7.31 (d, $J=9$ Hz, 2H), 7.59-7.68 (m, 2H), 7.78 (d, $J=9$ Hz, 2H), 7.97-8.10 (m, 4H), 8.57 (s, 1H), 10.42 (s, 1H), 13.03 (bs, 1H).

Molecular weight: 466.33

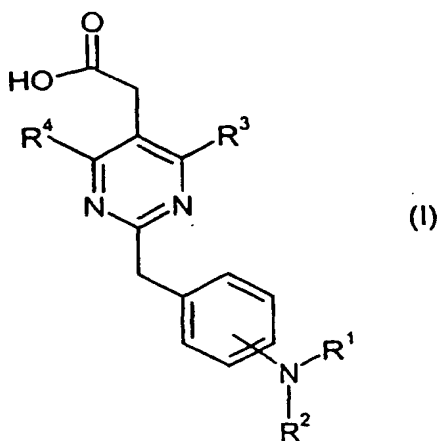
Mass spectrometry: 466

Melting point: 230 Z °C

Activity class: A

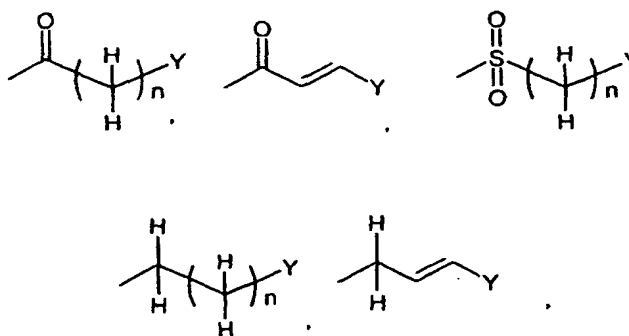
Claims

1. A pyrimidinylacetic acid derivative of the formula (I), its tautomeric or stereoisomeric form, or a salt thereof:

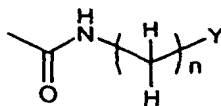


wherein

R^1 represents



or



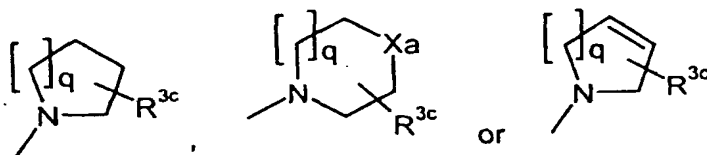
in which

n represents an integer of 0 to 6;

Y represents hydrogen, C_{3-8} cycloalkyl optionally substituted by C_{1-6} alkyl, C_{3-8} cycloalkyl fused by benzene, aryl or heteroaryl, wherein said aryl and heteroaryl are optionally substituted at a substitutable position with one or more substituents selected from the group consisting of cyano, halogen, nitro, guanidino, pyrrolyl, sulfamoyl, C_{1-6} alkylaminosulfonyl, di(C_{1-6} alkyl)aminosulfonyl, phenyloxy, phenyl, amino, C_{1-6} alkylamino, di(C_{1-6} alkyl)amino, C_{1-6} alkoxy, C_{1-6} alkanoyl, C_{1-6} alkanoylamino, carbamoyl, C_{1-6} alkylcarbamoyl, di(C_{1-6} alkyl)carbamoyl, C_{1-6} alkylsulfonyl, C_{1-6} alkyl optionally substituted by mono-, di-, or tri-halogen, C_{1-6} alkoxy optionally substituted by mono-, di-, or tri-halogen and C_{1-6} alkylthio optionally substituted by mono-, di-, or tri-halogen, or aryl fused by 1,3-dioxolane;

R^2 represents hydrogen or C_{1-6} alkyl;

R^3 represents halogen, C_{1-6} alkoxy optionally substituted by mono-, di-, or tri-halogen,



q represents an integer of 1 to 3;

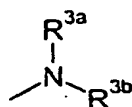
R^{3c} represents hydrogen, hydroxy, carboxy, or C_{1-6} alkyl optionally substituted by hydroxy, carboxy or (phenyl-substituted C_{1-6} alkyl)carbamoyl;

Xa represents -O-, -S- or -N(R^{3d})-

in which

R^{3d} represents C_{1-6} alkyl;

or



in which

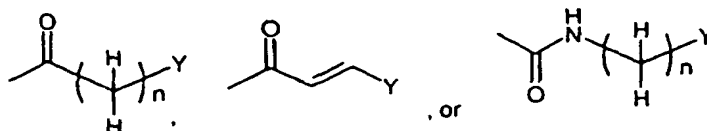
R^{3a} and R^{3b} independently represent C_{3-8} cycloalkyl, or C_{1-6} alkyl optionally substituted by carboxy, C_{3-8} cycloalkyl, carbamoyl, C_{1-6} alkylcarbamoyl, aryl-substituted C_{1-6} alkylcarbamoyl, C_{1-6} alkylcarbamoyl, di(C_{1-6} alkyl)carbamoyl, C_{3-8} cycloalkylcarbamoyl, C_{3-8} heterocyclocarbonyl, (C_{1-6} alkyl)amino, di(C_{1-6} alkyl)amino or C_{1-6} alkoxy; or

R^4 represents hydrogen, halogen, C_{1-6} alkoxy, di(C_{1-6} alkyl)amino or C_{1-6} alkyl optionally substituted by mono-, di-, or tri-halogen.

2. The pyrimidinylacetic acid derivative of the formula (I), its tautomeric or stereoisomeric form, or a salt thereof as

claimed in claim 1,
wherein

R¹ represents



in which

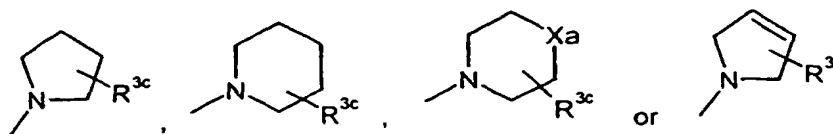
n represents an integer of 0 to 2;

Y represents C₃₋₈ cycloalkyl optionally substituted by C₁₋₆ alkyl, C₃₋₈ cycloalkyl fused by benzene, aryl selected from the group consisting of phenyl and naphthyl, or heteroaryl selected from the group consisting of indolyl, quinolyl, benzofuranyl, furanyl and pyridyl, wherein said aryl and heteroaryl are optionally substituted at a substitutable position with one or more substituents selected from the group consisting of cyano, halogen, nitro, pyrrolyl, sulfamoyl, C₁₋₆ alkylaminosulfonyl, di(C₁₋₆ alkyl)aminosulfonyl, phenyloxy, phenyl, C₁₋₆alkylamino, di(C₁₋₆)alkylamino, C₁₋₆ alkoxy carbonyl, C₁₋₆ alkanoylamino, carbamoyl, C₁₋₆ alkylcarbamoyl, di-(C₁₋₆ alkyl)carbamoyl, C₁₋₆ alkylsulfonyl, C₁₋₆ alkyl optionally substituted by mono-, di-, or tri-halogen, C₁₋₆ alkoxy optionally substituted by mono-, di-, or tri- halogen and C₁₋₆ alkylthio optionally substituted by mono-, di-, or tri- halogen; or

R² represents hydrogen.

3. The pyrimidinylacetic acid derivative of the formula (I), its tautomeric or stereoisomeric form, or a salt thereof as claimed in claim 1,
wherein

R³ represents C₁₋₆ alkoxy optionally substituted by mono-, di-, or tri- halogen,



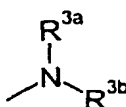
R^{3c} represents hydrogen, hydroxy, carboxy, or C₁₋₆ alkyl optionally substituted by hydroxy, carboxy or (phenyl-substituted C₁₋₆ alkyl)carbamoyl;

Xa represents -O-, -S- or -N(R^{3d})-,

in which

R^{3d} represents C₁₋₆ alkyl;

or



in which

R^{3a} and R^{3b} independently represent C₁₋₆ alkyl optionally substituted by carboxy, C₃₋₈ cycloalkyl, carbamoyl, C₁₋₆ alkylcarbamoyl, di(C₁₋₆ alkyl)carbamoyl, C₃₋₈ cycloalkylcarbamoyl, C₃₋₈ heterocyclocarbonyl, (C₁₋₆)alkylamino, di(C₁₋₆)alkylamino or C₁₋₆ alkoxy.

4. The pyrimidinylacetic acid derivative of the formula (I), its tautomeric or stereoisomeric form, or a salt thereof as claimed in claim 1, wherein said derivative of the formula (I) is selected from the group consisting of:

[4-methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-4-methyl-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 {4,6-dichloro-2-[4-(2-naphthoylamino)benzyl]pyrimidin-5-yl}acetic acid;
 {4-chloro-6-{methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino}-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(isopropylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclohexylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 (4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(3-phenylpropanoyl)amino]benzyl}-5-pyrimidinyl)acetic acid;
 (4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(2-quinolinylcarbonyl)amino]benzyl}-5-pyrimidinyl)acetic acid;
 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 {4-chloro-2-[4-{(4-chlorobenzoyl)amino}benzyl]-6-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(4-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(4-methylbenzoyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 {2-[4-{(1-benzofuran-2-ylcarbonyl)amino}benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(1H-indol-2-ylcarbonyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 {4-chloro-2-[4-{(4-cyanobenzoyl)amino}benzyl]-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-{4-[(2,3-dihydro-1H-inden-2-ylacetyl)amino]benzyl}-5-pyrimidinyl}acetic acid;
 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[(3-phenoxyphenyl)acetyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 (4-chloro-6-(dimethylamino)-2-{4-[(2-quinolinylcarbonyl)amino]benzyl}-5-pyrimidinyl)acetic acid;
 [4-chloro-6-(dimethylamino)-2-(4-{[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-[4-{(3,4-dichlorobenzoyl)amino}benzyl]-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(4-chlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 (4-chloro-6-(dimethylamino)-2-{4-[(4-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl)acetic acid;
 [4-chloro-6-(dimethylamino)-2-(4-{[4-(dimethylamino)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-6-(dimethylamino)-2-(4-{[4-(trifluoromethyl)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-(4-{[(2E)-3-(4-chlorophenyl)-2-propenoyl]amino}benzyl)-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [2-{4-[(4-bromobenzoyl)amino]benzyl}-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(2,5-dichlorobenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(3,4-difluorobenzoyl)amino]benzyl}-5-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-[4-{(3,5-dichlorobenzoyl)amino}benzyl]-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-[4-{(3-chlorobenzoyl)amino}benzyl]-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 (4-chloro-6-(dimethylamino)-2-{4-[(3-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl)acetic acid;
 [2-(4-{[(4-tert-butylcyclohexyl)carbonyl]amino}benzyl)-4-chloro-6-(dimethylamino)-5-pyrimidinyl]acetic acid;

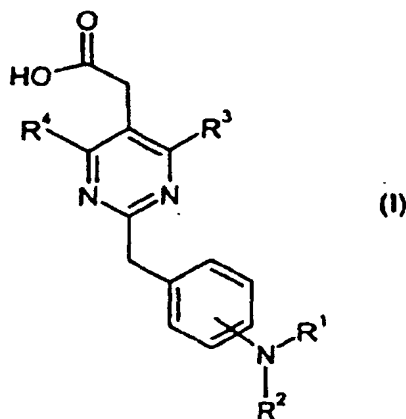
[4-chloro-2-{4-[(4-phenoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(4-isopropoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-6-(1-pyrrolidinyl)-2-{4-[(4-(1H-pyrrol-1-yl)benzoyl)amino]benzyl}-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(4-methoxy-3-nitrobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 5 [4-chloro-2-{4-[(4-methoxy-3,5-dimethylbenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(2E)-3-phenyl-2-propenoyl]amino}benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 10 {4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-[methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 [4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 15 [2-{4-[(4-chlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;
 (4-(dimethylamino)-2-{4-[(4-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl]acetic acid;
 [2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;
 [4-(dimethylamino)-2-(4-[(2E)-3-phenyl-2-propenoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 [2-(4-[(2E)-3-(4-chlorophenyl)-2-propenoyl]amino}benzyl)-4-(dimethylamino)-5-pyrimidinyl]acetic acid;
 20 [4-(dimethylamino)-2-(4-[(4-(trifluoromethyl)benzoyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 [2-{4-[(4-bromobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;
 {4-chloro-6-[cyclohexyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-chloro-6-[isopropyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-chloro-6-[(2-methoxyethyl)(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 25 {4-chloro-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 (4-chloro-6-(dimethylamino)-2-{4-[(1H-indol-6-ylcarbonyl)amino]benzyl}-5-pyrimidinyl]acetic acid;
 {4-chloro-6-methoxy-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 30 {4-chloro-6-(2,5-dihydro-1H-pyrrol-1-yl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-chloro-6-[ethyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 {4-chloro-6-(3-hydroxy-1-pyrrolidinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(4-(methylthio)benzoyl]amino}benzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(3-chloro-4-methoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 35 {2-[4-(benzoylamino)benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid;
 {4-chloro-2-{4-[(cyclohexylacetyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid;
 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-[(4-methylphenyl)acetyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 40 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(1-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-[(4-phenoxyphenyl)acetyl]amino}benzyl)-5-pyrimidinyl]acetic acid;
 45 [4-chloro-2-{4-[(3,4-dimethoxybenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]acetic acid;
 {4-chloro-6-(dimethylamino)-2-[3-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 [4-chloro-2-{4-[(4-nitrobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 [2-(4-[(4-(acetylamino)benzoyl]amino}benzyl)-4-chloro-6-(1-pyrrolidinyl)-5-pyrimidinyl]acetic acid;
 {2-[4-(benzoylamino)benzyl]-4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid;
 50 (4-(dimethylamino)-2-{4-[(2-quinolinylcarbonyl)amino]benzyl}-5-pyrimidinyl]acetic acid;
 (4-(dimethylamino)-2-{4-[(3-methoxybenzoyl)amino]benzyl}-5-pyrimidinyl]acetic acid;
 [2-{4-[(3-chlorobenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]acetic acid;
 N-{5-(carboxymethyl)-6-chloro-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl}-N-methylglycine;
 {4-chloro-6-(diethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]acetic acid;
 55 1-{5-(carboxymethyl)-6-chloro-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl}-L-proline;
 {2-[4-[(anilino)carbonyl]amino]benzyl}-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid;
 {2-(4-[(benzylamino)carbonyl]amino}benzyl)-4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]acetic acid;

no]-5-pyrimidinyl}acetic acid;
 {4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-{{(2-phenylethyl)amino}carbonyl}ami-
 no]benzyl]-5-pyrimidinyl}acetic acid;
 [4-chloro-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{{(2-naphthylamino)carbonyl}amino}ben-
 zyl)-5-pyrimidinyl}acetic acid;
 {4,6-bis(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid;
 [4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acetic acid;
 [4-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl}acetic acid; and
 {4-(dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}acetic acid.

5. A medicament comprising the pyrimidinylacetic acid derivative, its tautomeric or stereoisomeric form, or a physiologically acceptable salt thereof as claimed in claim 1 as an active ingredient.
6. The medicament as claimed in claim 5, further comprising one or more pharmaceutically acceptable excipients.
7. The medicament as claimed in claim 5, wherein said pyrimidinylacetic acid derivative of the formula (I), its tautomeric or stereoisomeric form, or a physiologically acceptable salt thereof is a CRTH2 antagonist.
8. The medicament as claimed in claim 5 for the treatment and/or prevention of a disorder or disease associated with CRTH2 activity.
9. The medicament as claimed in claim 8, wherein said disorder or disease is selected from the group consisting of asthma, allergic rhinitis, atopic dermatitis and allergic conjunctivitis.
10. The medicament as claimed in claim 8, wherein said disorder or disease is selected from the group consisting of Churg-Strauss syndrome, sinusitis, basophilic leukemia, chronic urticaria and basophilic leukocytosis.
11. Use of a compound according to claim 1 for manufacturing a medicament for the treatment and/or prevention of a disorder or disease associated with CRTH2 activity.

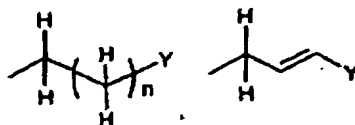
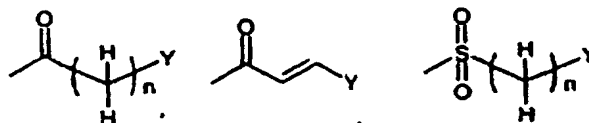
Patentansprüche

1. Derivat einer Pyrimidinylelessigsäure der Formel (I), seine tautomere oder stereoisomere Form oder ein Salz davon:

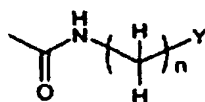


wobei

R¹ bedeutet:



oder



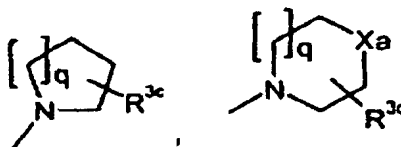
wobei bedeutet:

n eine ganze Zahl von 0 bis 6;

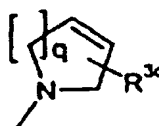
Y Wasserstoff, C₃₋₈-Cycloalkyl, welches optional mit C₁₋₆-Alkyl substituiert ist, C₃₋₈-Cycloalkyl, welches mit Benzol, Aryl oder Heteroaryl anelliert ist, wobei besagtes Aryl und Heteroaryl optional an einer substituierbaren Position mit einem oder mehreren Substituenten substituiert sind ausgewählt aus der Gruppe bestehend aus Cyan, Halogen, Nitro, Guanidino, Pyrrolyl, Sulfamoyl, C₁₋₆-Alkylaminosulfonyl, Di(C₁₋₆-Alkyl)-Aminosulfonyl, Phenyloxy, Phenyl, Amino, C₁₋₆-Alkylamino, Di(C₁₋₆-Alkyl)amino, C₁₋₆-Alkoxy-carbonyl, C₁₋₆-Alkanoyl, C₁₋₆-Alkanoylamino, Carbamoyl, C₁₋₆-Alkylcarbamoyl, Di-(C₁₋₆-Alkyl)-Carbamoyl, C₁₋₆-Alkylsulfonyl, C₁₋₆-Alkyl, welches optional substituiert ist mit Mono-, Di- oder Trihalogen, C₁₋₆-Alkoxy, welches optional substituiert ist mit Mono-, Di- oder Trihalogen, und C₁₋₆-Alkylthio, welches optional substituiert ist mit Mono-, Di- oder Trihalogen, oder Aryl, welches mit 1,3-Dioxolan anelliert ist;

R² Wasserstoff oder C₁₋₆-Alkyl;

R³ Halogen, C₁₋₆-Alkoxy, welches optional substituiert ist mit Mono-, Di- oder Trihalogen,



oder

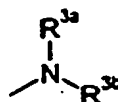


q eine ganze Zahl von 1 bis 3;

R^{3c} Wasserstoff, Hydroxy, Carboxy oder C₁₋₆-Alkyl, welches optional substituiert ist mit Hydroxy, Car-

boxy oder (Phenyl-substituiertem C₁₋₆-Alkyl)-Carbamoyl;
Xa -O-, -S- oder -N(R^{3d})-
wobei

R^{3d} bedeutet C₁₋₆-Alkyl;
oder



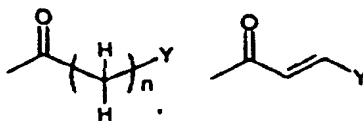
wobei

R^{3a} und R^{3b} unabhängig voneinander bedeuten C₃₋₈-Cycloalkyl oder C₁₋₆-Alkyl, welches optional substituiert ist mit Carboxy, C₃₋₈-Cycloalkyl, Carbamoyl, C₁₋₆-Alkylcarbamoyl, Aryl-substituiertes C₁₋₆-Alkylcarbamoyl, Di(C₁₋₆-Alkyl)-Carbamoyl, C₃₋₈-Cycloalkylcarbamoyl, C₃₋₈-Heterocyclocarbonyl, (C₁₋₆-Alkylamino, Di(C₁₋₆-Alkylamino oder C₁₋₆-Alkoxy; oder

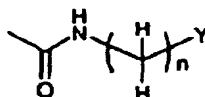
R⁴ Wasserstoff, Halogen, C₁₋₆-Alkoxy, Di-(C₁₋₆-Alkyl)-Amino oder C₁₋₆-Alkyl, welches optional mit Mono-, Di- oder Trihalogen substituiert ist.

2. Derivat einer Pyrimidinylessigsäure der Formel (I), seine tautomere oder stereoisomere Form oder ein Salz davon nach Anspruch 1, wobei

R¹ bedeutet



oder



wobei bedeutet:

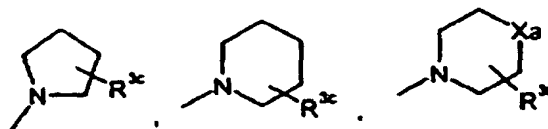
n eine ganze Zahl von 0 bis 2;

Y C₃₋₈-Cycloalkyl, welches optional mit C₁₋₆-Alkyl substituiert ist, C₃₋₈-Cycloalkyl, welches mit Benzol anelliert ist, Aryl, ausgewählt aus der Gruppe bestehend aus Phenyl und Naphthyl, oder Heteroaryl, ausgewählt aus der Gruppe bestehend aus Indolyl, Quinolyl, Benzofuranyl, Furanyl und Pyridyl, wobei besagtes Aryl und Heteroaryl optional an einer geeigneten Position mit einem oder mehreren Substituenten substituiert sind ausgewählt aus der Gruppe bestehend aus Cyan, Halogen, Nitro, Pyrrolyl, Sulfamoyl, C₁₋₆-Alkylaminosulfonyl, Di(C₁₋₆-Alkyl)-Aminosulfonyl, Phenyl, C₁₋₆-Alkylamino, Di(C₁₋₆-Alkyl)-Alkylamino, C₁₋₆-Alkoxy, C₁₋₆-Alkanoylamino, Carbamoyl, C₁₋₆-Alkylcarbamoyl, Di(C₁₋₆-Alkyl)-Carbamoyl, C₁₋₆-Alkylsulfonyl, C₁₋₆-Alkyl, welches optional mit Mono-, Di- oder Trihalogen substituiert ist, C₁₋₆-Alkoxy, welches optional mit Mono-, Di- oder Trihalogen substituiert ist und C₁₋₆-Alkylthio, welches optional mit Mono-, Di- oder Trihalogen substituiert ist; oder

R² Wasserstoff.

3. Derivat einer Pyrimidinylessigsäure der Formel (I), seine tautomere oder stereoisomere Form oder ein Salz davon nach Anspruch 1, wobei bedeutet:

R^3 C₁₋₆-Alkoxy, welches optional mit Mono-, Di- oder Trihalogen,



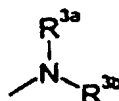
oder



substituiert ist,

R^{3c} Wasserstoff, Hydroxy, Carboxy oder C₁₋₆-Alkyl, welches optional mit Hydroxy, Carboxy oder (Phenyl-substituiertem C₁₋₆-Alkyl)-Carbamoyl substituiert ist; Xa -O-, -S- oder -N(R^{3d})-, wobei

R^{3d} C₁₋₆-Alkyl bedeutet; oder



wobei bedeuten:

R^{3a} und R^{3b} unabhängig voneinander C₁₋₆-Alkyl, welches optional mit Carboxy substituiert ist, C₃₋₈-Cycloalkyl, Carbamoyl, C₁₋₆-Alkylcarbamoyl, Di(C₁₋₆-Alkyl)-Carbamoyl, C₃₋₈-Cycloalkylcarbamoyl, C₃₋₈-Heterocyclocarbonyl, C₁₋₆-Alkylamino, Di(C₁₋₆-Alkylamino) oder C₁₋₆-Alkoxy.

4. Derivat einer Pyrimidinylessigsäure der Formel (I), seine tautomere oder stereoisomere Form oder ein Salz davon nach Anspruch 1, wobei besagtes Derivat der Formel (I) ausgewählt ist aus der Gruppe bestehend aus:

[4-Methyl-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
[2-[4-[(3,4-Dichlorbenzoyl)amino]benzyl]-4-methyl-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
{4,6-Dichlor-2-[4-(2-naphthoylamino)benzyl]pyrimidin-5-yl}-essigsäure;
{4-Chlor-6-{methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino}-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}-essigsäure;
{4-Chlor-6-(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}-essigsäure;
{4-Chlor-6-[[2-(isopropylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}-essigsäure;
{4-Chlor-6-[[2-(cyclohexylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl}-essigsäure;

nyl)-essigsäure;
 (4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3-phenylpropanoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 (4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2-quinolinylcarbonyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 5 [4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 {4-Chlor-2-[4-[(4-chlorbenzoyl)amino]benzyl]-6-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl)-essigsäure;
 10 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3,4-dichlorbenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(4-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(4-methylbenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 15 {2-[4-[(1-Benzofuran-2-yl-carbonyl)amino]benzyl]-4-chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl)-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(1H-indol-2-yl-carbonyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 20 {4-Chlor-2-[4-[(4-cyanobenzoyl)amino]benzyl]-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl)-essigsäure;
 (4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2,3-dihydro-1H-inden-2-yl-acetyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(3-phenoxyphenyl)acetyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 25 (4-Chlor-6-(dimethylamino)-2-[4-[(2-quinolinylcarbonyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-6-(dimethylamino)-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(3,4-dichlorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(4-chlorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 30 (4-Chlor-6-(dimethylamino)-2-[4-[(4-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-6-(dimethylamino)-2-[4-[(4-(dimethylamino)benzoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-6-(dimethylamino)-2-[4-[(4-(trifluormethyl)benzoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(2E)-3-(4-chlorphenyl)-2-propenoyl]amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 35 [2-[4-[(4-Brombenzoyl)amino]benzyl]-4-chlor-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(2,5-dichlorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(3,4-difluorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(3,5-dichlorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(3-chlorbenzoyl)amino]benzyl]-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 40 (4-Chlor-6-(dimethylamino)-2-[4-[(3-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [2-[4-[(4-Tert-butylcyclohexyl)carbonyl]amino]benzyl]-4-chlor-6-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(4-phenoxybenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(4-isopropoxybenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-6-(1-pyrrolidinyl)-2-[4-[(4-(1H-pyrrol-1-yl)benzoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 45 [4-Chlor-2-[4-[(4-methoxy-3-nitrobenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(4-methoxy-3,5-dimethylbenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 [4-Chlor-2-[4-[(3,4-dichlorbenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl)-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl)-essigsäure;
 50 {4-[[2-(Cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl)-essigsäure;
 {4-[Methyl[2-oxo-2-(1-pyrrolidinyl)ethyl]amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl)-essigsäure;
 {4-(Dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl)-essigsäure;
 55 [4-[[2-(Cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2E)-3-phenyl-2-propenoyl]amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [2-[4-[(4-Chlorbenzoyl)amino]benzyl]-4-(dimethylamino)-5-pyrimidinyl)-essigsäure;
 (4-(Dimethylamino)-2-[4-[(4-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;

[2-{4-[(3,4-Dichlorbenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]-essigsäure;
 [4-(Dimethylamino)-2-(4-[(2E)-3-phenyl-2-propenoyl]amino)benzyl]-5-pyrimidinyl]-essigsäure;
 [2-(4-[(2E)-3-(4-Chlorphenyl)-2-propenoyl]amino)benzyl]-4-(dimethylamino)-5-pyrimidinyl]-essigsäure;
 [4-(Dimethylamino)-2-(4-[(4-(trifluormethyl)benzoyl]amino)benzyl]-5-pyrimidinyl]-essigsäure;
 5 [2-{4-[(4-Brombenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-[cyclohexyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-[isopropyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-[(2-methoxyethyl)(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 10 [4-Chlor-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl]-essigsäure;
 [4-Chlor-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 (4-Chlor-6-(dimethylamino)-2-{4-[(1H-indol-6-yl-carbonyl)amino]benzyl}-5-pyrimidinyl)-essigsäure;
 {4-Chlor-6-methoxy-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-(2,5-dihydro-1H-pyrol-1-yl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 15 {4-Chlor-6-[ethyl(methyl)amino]-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-(3-hydroxy-1-pyrrolidinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 [4-Chlor-2-(4-{4-(methylthio)benzoyl}amino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 [4-Chlor-2-{4-[(3-Chlor-4-methoxybenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 {2-[4-(Benzoylamino)benzyl]-4-chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]-essigsäure;
 20 {4-Chlor-2-{4-[(cyclohexylacetyl)amino]benzyl}-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]-essigsäure;
 [4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[(4-methylphenyl)acetyl]amino}benzyl)-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-(1-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 25 [4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-{[(4-phenoxyphenyl)acetyl]amino}benzyl)-5-pyrimidinyl]-essigsäure;
 [4-Chlor-2-{4-[(3,4-dimethoxybenzoyl)amino]benzyl}-6-(dimethylamino)-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-(dimethylamino)-2-[3-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 30 [4-Chlor-2-{4-[(4-nitrobenzoyl)amino]benzyl}-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 [2-(4-[(4-Acetylamino)benzoyl]amino)benzyl]-4-chlor-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 {2-[4-(Benzoylamino)benzyl]-4-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]-essigsäure;
 (4-(Dimethylamino)-2-[4-[(2-quinolinylcarbonyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 35 (4-(Dimethylamino)-2-[4-[(3-methoxybenzoyl)amino]benzyl]-5-pyrimidinyl)-essigsäure;
 [2-{4-[(3-Chlorbenzoyl)amino]benzyl}-4-(dimethylamino)-5-pyrimidinyl]-essigsäure;
 N-(5-(Carboxymethyl)-6-chlor-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl)-N-methylglycine;
 (4-Chlor-6-(diethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl)-essigsäure;
 1-{5-(Carboxymethyl)-6-chlor-2-[4-(2-naphthoylamino)benzyl]-4-pyrimidinyl}-L-prolin;
 40 {2-[4-[(Anilinocarbonyl)amino]benzyl]-4-chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]-essigsäure;
 {2-(4-[(Benzylamino)carbonyl]amino)benzyl}-4-chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-5-pyrimidinyl]-essigsäure;
 {4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-[4-[(2-phenylethyl)amino]carbonyl]amino)benzyl]-5-pyrimidinyl]-essigsäure;
 45 [4-Chlor-6-[[2-(cyclopentylamino)-2-oxoethyl](methyl)amino]-2-(4-[(2-naphthylamino)carbonyl]amino)benzyl]-5-pyrimidinyl]-essigsäure;
 {4,6-Bis(dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure;
 [4-(Dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-essigsäure;
 50 [4-(Dimethylamino)-2-[4-(2-naphthoylamino)benzyl]-6-(1-piperidinyl)-5-pyrimidinyl]-essigsäure; und
 {4-(Dimethylamino)-6-(4-morpholinyl)-2-[4-(2-naphthoylamino)benzyl]-5-pyrimidinyl]-essigsäure.

5. Arzneimittel, umfassend als einen wirksamen Bestandteil das Derivat einer Pyrimidinylessigsäure, seine tautomere oder stereoisomere Form oder ein physiologisch verträgliches Salz davon nach Anspruch 1.

6. Arzneimittel nach Anspruch 5, welches weiter einen oder mehrere pharmazeutisch verträgliche Hilfsstoffe umfasst.

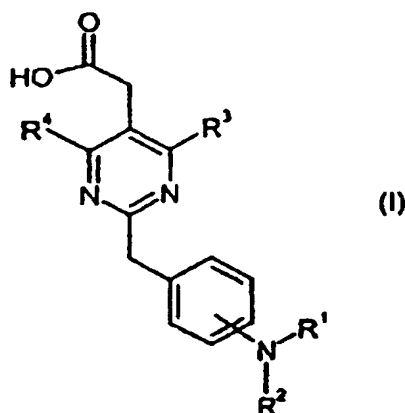
7. Arzneimittel nach Anspruch 5, wobei besagtes Derivat einer Pyrimidinylessigsäure der Formel (I), seine tautomere

oder stereoisomere Form oder ein physiologisch verträgliches Salz davon ein CRTH2-Antagonist ist.

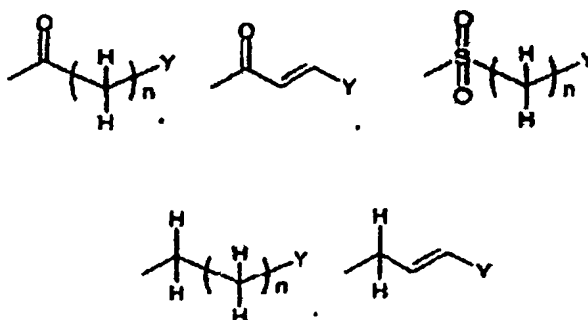
8. Arzneimittel nach Anspruch 5 zur Behandlung und/oder Verhütung einer Funktionsstörung oder einer Krankheit, welche mit CRTH2-Wirksamkeit verbunden ist.
9. Arzneimittel nach Anspruch 8, wobei besagte Funktionsstörung oder Krankheit ausgewählt ist aus der Gruppe bestehend aus Asthma, allergische Rhinitis, atopische Dermatitis und allergische Konjunktivitis.
10. Arzneimittel nach Anspruch 8, wobei besagte Funktionsstörung oder Krankheit ausgewählt ist aus der Gruppe bestehend aus Churg-Strauss-Syndrom, Sinusitis, basophile Leukämie, chronische Urtikaria und basophile Leukocytose.
11. Verwendung einer Verbindung nach Anspruch 1 zur Herstellung eines Arzneimittels für die Behandlung und/oder Verhütung einer Funktionsstörung oder Krankheit, welche mit CRTH2-Wirksamkeit verbunden ist.

Revendications

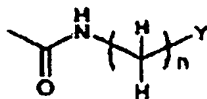
1. Dérivé de l'acide pyrimidinylacétique de formule (I), sa forme tautomère ou stéréoisomère, ou un sel de celui-ci :



dans lequel
R¹ représente



ou



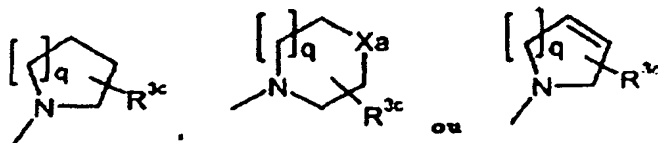
où

n représente un nombre entier de 0 à 6 ;

Y représente un hydrogène, un cycloalkyle en C₃-C₈ éventuellement substitué par un alkyle en C₁-C₆, un cycloalkyle en C₃-C₈ fusionné par un benzène, un aryle ou un hétéroaryle, où lesdits aryle et hétéroaryle sont éventuellement substitués au niveau d'une position qui peut être substituée par un ou plusieurs substituants choisis dans le groupe constitué par un cyano, un halogène, un nitro, un guanidino, un pyrrolyle, un sulfamoyle, un alkyl(en C₁-C₆)amino-sulfonyle, un di(alkyl en C₁-C₆)aminosulfonyle, un phényloxy, un phényle, un amino, un alkyl(en C₁-C₆) amino, un di(alkyl en C₁-C₆) amino, un alcoxy(en C₁-C₆) carbonyle, un alcanoyle en C₁-C₆, un alcanoyl (en C₁-C₆) amino, un carbamoyle, un alkyl(en C₁-C₆)carbamoyle, un di(alkyl en C₁-C₆) carbamoyle, un alkyl(en C₁-C₆) sulfonyle, un alkyle en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène, un alcoxy en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène, un alkyl(en C₁-C₆)thio éventuellement substitué par un mono-, di- ou tri-halogène ou un aryle fusionné par un 1,3-dioxolane ;

R² représente un hydrogène ou un alkyle en C₁-C₆ ;

R³ représente un halogène, un alcoxy en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène,



q représente un nombre entier de 1 à 3 ;

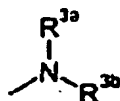
R^{3c} représente un hydrogène, un hydroxy, un carboxy ou un alkyle en C₁-C₆ éventuellement substitué par un hydroxy, un carboxy ou un (alkyl en C₁-C₆ substitué par un phényle)carbamoyle ;

Xa représente -O-, -S- ou -N(R^{3d})-

où

R^{3d} représente un alkyle en C₁-C₆ ;

ou

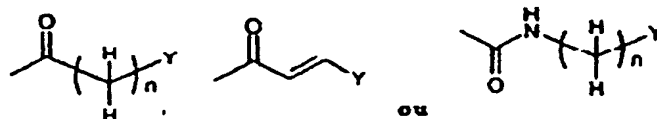


où

R^{3a} et R^{3b} représentent indépendamment un cycloalkyle en C₃-C₈ ou un alkyle en C₁-C₆ éventuellement substitué par un carboxy, un cycloalkyle en C₃-C₈, un carbamoyle, un alkyl (en C₁-C₆) carbamoyle, un alkyl (en C₁-C₆) carbamoyle substitué par un aryle, un alkyl(en C₁-C₆) carbamoyle, un di (alkyl en C₁-C₆) carbamoyle, un cycloalkyl (en C₃-C₈) carbamoyle, un hétérocyclocarbonyle en C₃-C₈, un alkyl (en C₁-C₆) amino, un di(alkyl en C₁-C₆) amino ou un alcoxy en C₁-C₆ ; ou

R⁴ représente un hydrogène, un halogène, un alcoxy en C₁-C₆, un di(alkyl en C₁-C₆) amino ou un alkyle en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène.

2. Dérivé de l'acide pyrimidinylacétique de formule (I), sa forme tautomère ou stéréoisomère, ou un sel de celui-ci selon la revendication 1, dans lequel R¹ représente



où

n représente un nombre entier de 0 à 2 ;

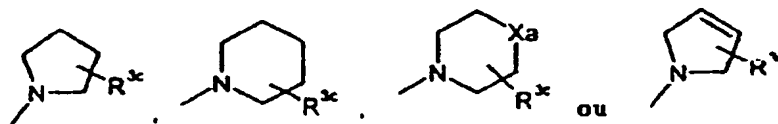
Y représente un cycloalkyle en C₃-C₈ éventuellement substitué par un alkyle en C₁-C₆, un cycloalkyle en C₃-C₈ fusionné par un benzène, un aryle choisi dans le groupe constitué par un phényle et un naphyle, ou un hétéroaryle choisi dans le groupe constitué par un indolye, un quinoléine, un benzofuranyle, un furanyle et un pyridyle, où lesdits aryle et hétéroaryle sont éventuellement substitués au niveau d'une position qui peut être substituée par un ou plusieurs substituants choisis dans le groupe constitué par un cyano, un halogène, un nitro, un pyrrolyle, un sulfamoyle, un alkyl(en C₁-C₆)aminosulfonyle, un di(alkyl en C₁-C₆)aminosulfonyle, un phényloxy, un phényle, un alkyl(en C₁-C₆) amino, un di(alkyl en C₁-C₆) amino, un alcoxy(en C₁-C₆)carbonyle, un alcanoyl(en C₁-C₆)amino, un carbamoyle, un alkyl(en C₁-C₆)carbamoyle, un di(alkyl en C₁-C₆) carbamoyle, un alkyl(en C₁-C₆)sulfonyle, un alkyle en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène, un alcoxy en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène, un alkyl(en C₁-C₆)thio éventuellement substitué par un mono-, di- ou tri-halogène ; ou

R² représente un hydrogène.

3. Dérivé de l'acide pyrimidinylacétique de formule (I), sa forme tautomère ou stéréoisomère, ou un sel de celui-ci selon la revendication 1,

dans lequel

R³ représente un alcoxy en C₁-C₆ éventuellement substitué par un mono-, di- ou tri-halogène,



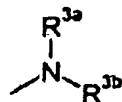
R^{3c} représente un hydrogène, un hydroxy, un carboxy ou un alkyle en C₁-C₆ éventuellement substitué par un hydroxy, un carboxy ou un (alkyl en C₁-C₆ substitué par un phényle)carbamoyle ;

X_a représente -O-, -S- ou -N(R^{3d})-

où

R^{3d} représente un alkyle en C₁-C₆ ;

ou



où

R^{3a} et R^{3b} représentent indépendamment un alkyle en C₁-C₆ éventuellement substitué par un carboxy, un cycloalkyle en C₃-C₈, un carbamoyle, un alkyl(en C₁-C₆)carbamoyle, un di(alkyl en C₁-C₆)carbamoyle, un cycloalkyl(en C₃-C₈)carbamoyle, un hétérocyclocarbonyle en C₃-C₈, un alkyl(en C₁-C₆) amino, un di(alkyl en C₁-C₆) amino ou un alcoxy en C₁-C₆.

4. Dérivé de l'acide pyrimidinylacétique de formule (I), sa forme tautomère ou stéréoisomère, ou un sel de celui-ci selon la revendication 1, où ledit dérivé de formule (I) est choisi dans le groupe constitué par :

l'acide [4-méthyl-2-[4-(2-naphtoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;

l'acide [2-{4-[(3,4-dichlorobenzoyl)amino]benzyl}-4-méthyl-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
l'acide {4,6-dichloro-2-[4-(2-naphtoylamino)-benzyl]pyrimidin-5-yl}acétique ;
l'acide {4-chloro-6-{méthyl[2-oxo-2-(1-pyrrolidinyl)éthyl]amino}-2-[4-(2-naphtoylamino)-benzyl]-5-pyrimidinyl}acétique ;
5 l'acide {4-chloro-6-(diméthylamino)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-6-[[2-(isopropylamino)-2-oxoéthyl](méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-6-[[2-(cyclohexylamino)-2-oxoéthyl](méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
10 l'acide (4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(3-phénylpropanoyl)-amino]benzyl]-5-pyrimidinyl}acétique ;
l'acide (4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(2-quinolinyldicarbonyl)-amino]benzyl]-5-pyrimidinyl}acétique ;
l'acide [4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(2E)-3-phényl-2-propénoyl]amino]benzyl]-5-pyrimidinyl}acétique ;
15 l'acide {4-chloro-2-[4-[(4-chlorobenzoyl)amino]-benzyl]-6-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)-amino]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(3,4-dichlorobenzoyl)-amino]benzyl]-5-pyrimidinyl}acétique ;
20 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(4-méthoxybenzoyl)amino]-benzyl]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(4-méthylbenzoyl)amino]-benzyl]-5-pyrimidinyl}acétique ;
l'acide {2-[4-[(1-benzofuran-2-ylcarbonyl)amino]-benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-5-pyrimidinyl}acétique ;
25 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(1H-indol-2-ylcarbonyl)-amino]benzyl]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-2-[4-[(4-cyanobenzoyl)amino]-benzyl]-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)-amino]-5-pyrimidinyl}acétique ;
30 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(2,3-dihydro-1H-indén-2-ylacétyl)amino]benzyl]-5-pyrimidinyl}acétique ;
l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[(3-phénoxyphényl)-acétyl]amino]benzyl]-5-pyrimidinyl}acétique ;
l'acide (4-chloro-6-(diméthylamino)-2-[4-[(2-quinolinyldicarbonyl)amino]benzyl]-5-pyrimidinyl)-acétique ;
35 l'acide [4-chloro-6-(diméthylamino)-2-[4-[(2E)-3-phényl-2-propénoyl]amino]benzyl]-5-pyrimidinyl}-acétique ;
l'acide [4-chloro-2-[4-[(3,4-dichlorobenzoyl)-amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(4-chlorobenzoyl)amino]-benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide (4-chloro-6-(diméthylamino)-2-[4-[(4-méthoxybenzoyl)amino]benzyl]-5-pyrimidinyl}acétique ;
40 l'acide [4-chloro-6-(diméthylamino)-2-[4-[(4-(diméthylamino)benzoyl]amino]benzyl]-5-pyrimidinyl]-acétique ;
l'acide [4-chloro-6-(diméthylamino)-2-[4-[(4-(trifluorométhyl)benzoyl]amino]benzyl]-5-pyrimidinyl]-acétique ;
l'acide [4-chloro-2-[4-[(2E)-3-(4-chlorophényl)-2-propénoyl]amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl}acétique ;
l'acide [2-[4-[(4-bromobenzoyl)amino]benzyl]-4-chloro-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(2,5-dichlorobenzoyl)-amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
45 l'acide [4-chloro-2-[4-[(3,4-difluorobenzoyl)-amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(3,5-dichlorobenzoyl)-amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(3-chlorobenzoyl)amino]-benzyl]-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide (4-chloro-6-(diméthylamino)-2-[4-[(3-méthoxybenzoyl)amino]benzyl]-5-pyrimidinyl}acétique ;
50 l'acide [2-[4-[(4-tert-butylcyclohexyl)carbonyl]-amino]benzyl]-4-chloro-6-(diméthylamino)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(4-phénoxybenzoyl)amino]-benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(4-isopropoxybenzoyl)-amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-acétique ;
l'acide [4-chloro-6-(1-pyrrolidinyl)-2-[4-[(4-(1H-pyrrol-1-yl)benzoyl]amino]benzyl]-5-pyrimidinyl]-acétique ;
55 l'acide [4-chloro-2-[4-[(4-méthoxy-3-nitrobenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(4-méthoxy-3,5-diméthylbenzoyl)amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(2E)-3-phényl-2-propénoyl]amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
l'acide [4-chloro-2-[4-[(3,4-dichlorobenzoyl)-amino]benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]-acétique ;

l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-[[2-(cyclopentylamino)-2-oxoéthyl]-(méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 5 l'acide {4-{méthyl[2-oxo-2-(1-pyrrolidinyl)éthyl]-amino}-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}-acétique ;
 l'acide {4-(diméthylamino)-2-[4-(2-naphtoylamino)-benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-[[2-(cyclopentylamino)-2-oxoéthyl]-(méthyl)amino]-2-(4-[[2E)-3-phényl-2-propénoyl]amino]-benzyl)-5-pyrimidinyl}acétique ;
 l'acide {2-[4-[(4-chlorobenzoyl)amino]benzyl]-4-(diméthylamino)-5-pyrimidinyl}acétique ;
 10 l'acide {4-(diméthylamino)-2-[4-[(4-méthoxybenzoyl)amino]benzyl]-5-pyrimidinyl}acétique ;
 l'acide {2-[4-[(3,4-dichlorobenzoyl)amino]benzyl]-4-(diméthylamino)-5-pyrimidinyl}acétique ;
 l'acide {4-(diméthylamino)-2-(4-[[2E)-3-phényl-2-propénoyl]amino]benzyl)-5-pyrimidinyl}acétique ;
 l'acide {2-(4-[[2E)-3-(4-chlorophényl)-2-propénoyl]amino]benzyl)-4-(diméthylamino)-5-pyrimidinyl}acétique ;
 15 l'acide {2-[4-[(4-bromobenzoyl)amino]benzyl]-4-(diméthylamino)-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[cyclohexyl(méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[isopropyl(méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[(2-méthoxyéthyl)(méthyl)-amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}-acétique ;
 l'acide {4-chloro-6-(4-morpholiny)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 20 l'acide {4-chloro-2-[4-(2-naphtoylamino)benzyl]-6-(1-pipéridinyl)-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-2-[4-(2-naphtoylamino)benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-(diméthylamino)-2-[4-[(1H-indol-6-ylcarbonyl)amino]benzyl]-5-pyrimidinyl}-acétique ;
 l'acide {4-chloro-6-méthoxy-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-(2,5-dihydro-1H-pyrrol-1-yl)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 25 l'acide {4-chloro-6-[éthyl(méthyl)amino]-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-(3-hydroxy-1-pyrrolidinyl)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-2-(4-[[4-(méthylthio)benzoyl]-amino]benzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl}-acétique ;
 l'acide {4-chloro-2-(4-[(3-chloro-4-méthoxybenzoyl)amino]benzyl)-6-(1-pyrrolidinyl)-5-pyrimidinyl}acétique ;
 l'acide {2-[4-(benzoylamino)benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-5-pyrimidinyl}acétique ;
 30 l'acide {4-chloro-2-[4-[(cyclohexylacétyl)amino]-benzyl]-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)-amino]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-(4-[[4-méthylphényl]acétyl]-amino)benzyl)-5-pyrimidinyl}acétique ;
 35 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-(1-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-(4-[[4-phénoxyphényl]-acétyl]amino)benzyl)-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-2-[4-[(3,4-diméthoxybenzoyl)-amino]benzyl]-6-(diméthylamino)-5-pyrimidinyl}acétique ;
 40 l'acide {4-chloro-6-(diméthylamino)-2-[3-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-2-[4-[(4-nitrobenzoyl)amino]-benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl}acétique ;
 l'acide {2-(4-[[4-(acétylamino)benzoyl]amino]-benzyl)-4-chloro-6-(1-pyrrolidinyl)-5-pyrimidinyl}-acétique ;
 l'acide {2-[4-(benzoylamino)benzyl]-4-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-5-pyrimidinyl}acétique ;
 45 l'acide {4-(diméthylamino)-2-[4-[(2-quinoliny]carbonyl)amino]benzyl}-5-pyrimidinyl}acétique ;
 l'acide {4-(diméthylamino)-2-[4-[(3-méthoxybenzoyl)amino]benzyl]-5-pyrimidinyl}acétique ;
 l'acide {2-[4-[(3-chlorobenzoyl)amino]benzyl]-4-(diméthylamino)-5-pyrimidinyl}acétique ;
 la N-{5-(carboxyméthyl)-6-chloro-2-[4-(2-naphtoylamino)benzyl]-4-pyrimidinyl}-N-méthylglycine ;
 l'acide {4-chloro-6-(diméthylamino)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 50 la 1-{5-(carboxyméthyl)-6-chloro-2-[4-(2-naphtoylamino)benzyl]-4-pyrimidinyl}-L-proline ;
 l'acide {2-[4-[(anilino)carbonyl]amino]benzyl]-4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)-amino]-5-pyrimidinyl}acétique ;
 l'acide {2-(4-[[4-(benzylamino)carbonyl]amino]-benzyl)-4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl]-(méthyl)amino]-5-pyrimidinyl}acétique ;
 55 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-[4-[[2-phényléthyl]amino]-carbonyl]amino]benzyl)-5-pyrimidinyl}acétique ;
 l'acide {4-chloro-6-[[2-(cyclopentylamino)-2-oxoéthyl](méthyl)amino]-2-(4-[[2-naphtylamino]-carbonyl]amino)benzyl)-5-pyrimidinyl}acétique ;

l'acide {4,6-bis(diméthylamino)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique ;
 l'acide [4-(diméthylamino)-2-[4-(2-naphtoylamino)-benzyl]-6-(1-pyrrolidinyl)-5-pyrimidinyl]acétique ;
 l'acide [4-(diméthylamino)-2-[4-(2-naphtoylamino)-benzyl]-6-(1-pipéridinyl)-5-pyrimidinyl]acétique ; et
 l'acide {4-(diméthylamino)-6-(4-morpholinyl)-2-[4-(2-naphtoylamino)benzyl]-5-pyrimidinyl}acétique.

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5. Médicament comprenant le dérivé de l'acide pyrimidinylacétique, sa forme tautomère ou stéréoisomère, ou un sel physiologiquement acceptable de celui-ci selon la revendication 1 comme principe actif.
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6. Médicament selon la revendication 5, comprenant en outre un ou plusieurs excipients pharmaceutiquement acceptables.
7. Médicament selon la revendication 5, dans lequel ledit dérivé de l'acide pyrimidinylacétique de formule (I), sa forme tautomère ou stéréoisomère, ou un sel physiologiquement acceptable de celui-ci est un antagoniste du CRTH2.
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8. Médicament selon la revendication 5 destiné au traitement et/ou à la prévention d'un trouble ou d'une maladie associé(e) à l'activité du CRTH2.
9. Médicament selon la revendication 8, où ledit trouble ou ladite maladie est choisi dans le groupe constitué de l'asthme, la rhinite allergique, la dermite atopique et la conjonctivite allergique.
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10. Médicament selon la revendication 8, où ledit trouble ou ladite maladie est choisi dans le groupe constitué du syndrome de Churg-Strauss, la sinusite, la leucémie à basophiles, l'urticaire chronique et la polynucléose basophile.
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11. Utilisation d'un composé selon la revendication 1 pour la fabrication d'un médicament destiné au traitement et/ou à la prévention d'un trouble ou d'une maladie associé(e) à l'activité du CRTH2.

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